SEVENTH ANNUAL REPORT

OF THE

METROPOLITAN SEWERAGE COMMISSION

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Proposed High Level Pumping Station. Ward St., Roxbury.

PUBLIC DOCUMENT . . . . No. 45.

TWELFTH ANNUAL REPORT

OF THE

BOARD

OF

Mass:

METROPOLITAN SEWERAGE COMMISSIONERS,

FOR THE

YEAR ENDING SEPTEMBER 30, 1900.

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Commonwealth of Massachusetts.

To the Honorable the Senate and the House of Representatives in General Court assembled.

The Board of Metropolitan Sewerage Commissioners, created by chapter 439, Acts of 1889, respectfully submits its report for the year ending Sept. 30, 1900, being its

Twelfth Annual Report.

The work of the Board during the past year has consisted of: (1) construction of the high-level sewer authorized by chapter 424, Acts of 1899, including the preparation of studies, surveys and estimates, and the acquisition of rights of way; (2) the necessary engineering work connected with the letting of contracts for the Wakefield extension and the Chelsea and Everett relief sewers, respectively authorized by chapters 172 and 184, Acts of 1900; (3) maintenance and operation of the completed North Metropolitan, Charles River and Neponset valley systems, consisting of about 70 miles of trunk sewers, 4 pumping stations and other appurtenances.

At the date of its last report the Board was just entering upon the constructional work for the high-level sewer. Contract plans for 4 sections of the work had been prepared and advertisements for bids published. During the year work on this system has been prosecuted vigorously, and at the date of this report construction on 9 contract sections, having a total length of about 5 miles, is in progress. The necessary plans, drawings, calculations and studies for many other sections have been made, in anticipation of an early letting. A site for a pumping station on Ward Street, Roxbury, has been purchased. Plans have been prepared for the buildings, foundations and connections, and much study given to the equipment of the station. Contracts have also been made for the construction of two sections of the Chelsea and Everett relief sewers, and the Wakefield extension will shortly be placed under contract.

The amount of sewer construction now in progress is greater than at any previous period in the history of the Board, and a still larger amount of work is contemplated for the ensuing year.

The completed sewerage systems have been maintained economically and satisfactorily. The additions to the existing plants at Deer Island, East Boston, Charlestown and Alewife Brook pumping stations, authorized by chapter 424, Acts of 1898, have been installed, and at the three stations first mentioned are in satisfactory operation.

Your attention is respectfully invited to the appended report of the Chief Engineer, and the tables following in connection with this report, for fuller details of the work of construction, maintenance and operation.

Expenditures.

During the year ending Sept. 30, 1900, expenditures have been as follows: —

Construction.

North Metropolitan system: —			
Additions to existing pumping plants,	$50,304 65		
Wakefield extension,	2,762 89		
Chelsea and Everett outlets,	1,809 15		
		$54,876 69	
South Metropolitan system: —			
Charles River valley (Watertown siphon),	$10,912 00		
Neponset River valley,	13,237 75		
High-level sewer,	347,302 48		
		371,452 23	
Total expenditures on construction,			$426,328 92

Maintenance.

North Metropolitan system: —			
Entire system for the year,		$86,907 77	
South Metropolitan system: —			
Charles River valley,	$47,891 09		
Neponset River valley,	21,402 76		
		69,293 85	
Total expenditures on maintenance,			156,201 62
Total expenditures for the year,			$582,530 54

Appropriations and Unexpended Balances to Date.

Following is a list of the several appropriations made by the Legislature for the construction of the Metropolitan sewerage systems, with the balances available, to date: —

North Metropolitan System.

1889, chapter 439, original act (portion of $5,000,000 devoted to this system),	$4,210,865 73
1894, chapter 307, additional loan,	500,000 00
1895, chapter 294, additional loan,	300,000 00
1896, chapter 414, Greenwood and Boyntonville (Wakefield),	30,000 00
1897, chapter 88, Greenwood and Boyntonville (Wakefield), additional loan,	5,000 00
1897, chapter 436, additional outlet, Stoneham,	10,000 00
1897, chapter 520, Lexington extension,	70,000 00
1898, chapter 215, additional outlet, Everett,	60,000 00
1898, chapter 424, additions to existing pumping plants,	155,000 00
1900, chapter 172, Wakefield branch,	175,000 00
1900, chapter 184, additional outlets, Chelsea and Everett,	90,000 00
Total appropriation,	$5,605,865 73
Additions (sales of land, etc.),	9,291 98
Available,	$5,615,157 71
Expended to date,	5,317,274 37
Balance Sept. 30, 1900,	$297,883 34

South Metropolitan System.

Charles River valley: —

1889, chapter 439, original act (portion of $5,000,000 devoted to this system),	$789,134 27
1900, chapter 464, Watertown siphon purchase,	10,912 00
Total appropriation,	$800,046 27
Expended to date,	800,046 27

Neponset River valley: —

1895, chapter 406, original loan,	$500,000 00
1897, chapter 83, additional loan,	300,000 00
1898, chapter 180, additional loan,	35,000 00
1899, chapter 241, additional loan,	25,000 00
Total appropriation,	$860,000 00
Additions (cash received for pumping ground water),	109 50
Available,	$860,109 50
Expended to date,	853,682 48
Balance Sept. 30, 1900,	$6,427 02

High-level sewer: —	
1899, chapter 424, original act,	$4,600,000 00
Expended to date,	391,910 94
Balance Sept. 30, 1900,	$4,208,089 86

Apportionment of Cost of Construction and Maintenance.

The cost of the Metropolitan sewerage systems is met by annual payments apportioned among the cities and towns in the district every five years by a commission appointed by the Supreme Judicial Court. At the present time the cities and towns of the North Metropolitan district are paying according to the ratios determined by the apportionment commission of 1896, whose award applies to a period of five years, 1896 to 1900, inclusive. This apportionment included also the ratios for cities and towns of the Charles River and Neponset valley districts during the years 1896 to 1900, inclusive. But chapter 424 of the Acts of 1899, providing for the construction of the high-level system, abolished the Charles River and Neponset valley systems, as separate systems, and united the Charles River, Neponset valley and high-level districts into a new district, to be known after the date of the act as the South Metropolitan district. The act further provided that apportionment commissioners shall "determine the proportion in which each of the cities and towns [of the South Metropolitan system] shall pay money into the treasury of the Commonwealth for the term of five years next after the year of the first issue of said scrip or certificate."

The Supreme Judicial Court appointed, on March 27, 1900, a commission to determine the ratios of payment by the cities and towns of the South Metropolitan district for a period of five years, from 1900 to 1904, inclusive.

The report of the apportionment commissioners can be found on page 25.

Details of the work for the year follow.

HIGH-LEVEL SEWER.

Section 1 of chapter 424, Acts of 1899, provides "that no part of said proposed outlet or sewerage system [for the high-level district] between Hyde Park and the outlet, shall be constructed before the year nineteen hundred, and until plans for said outlet shall be further considered by said board, and adopted and approved by the state board of health." Detailed investigations to determine the precise location of the harbor outfalls have been made by the State Board of Health. On May 2, 1900, there was submitted to the State Board of Health, for its approval, a plan showing the proposed main sewer from Hough's Neck to Nut Island, the location of controlling works on the island, and the two lines of 60-inch outfall pipes leading thence to points about one mile beyond the island.

On May 11, 1900, the following communication was received from the State Board of Health: —

> The State Board of Health hereby adopts and approves the plans for the proposed outlets near Peddock's Island, as shown on a plan entitled "Plan showing outlet at Nut Island recommended for high-level gravity sewer, Boston, Massachusetts, May, 1900," signed by the Metropolitan Sewerage Commissioners and submitted to the State Board of Health on May 2, 1900, under the provisions of chapter 424 of the Acts of 1899; both of said outlets being located one mile from Nut Island, one directly north of the middle of the island and the other 1,500 feet east of the first.
>
> By order of the Board,
>
> (Signed) Saml. W. Abbott,
> *Secretary.*

The outlets, as above approved, are located about 2,000 feet farther seaward than was contemplated in the preliminary report on which the appropriation for the high-level sewer was based. This will increase the length of 60-inch cast-iron pipe, to be laid below the bed of the harbor, by about 4,000 feet, at a probable additional cost of $150,000.

ROUTE OF THE HIGH-LEVEL SEWER NORTH OF THE NEPONSET RIVER.

The route of the high-level sewer through Roxbury, West Roxbury and Hyde Park, and constructional features of different sections of the work now in progress, are described in the report of the Chief Engineer, appended.

The projected route of Section 71, in West Roxbury, which involved tunnelling under Hemlock Hill in the Arnold Arboretum, was modified, to avoid the possibility of damage to valuable trees. The contract for this section was amended, and the sewer will be constructed in South Street, near the base of the hill.

The route of the connecting sewer from the existing Charles River main sewer in Huntington Avenue to the proposed pumping station at Ward Street will lie within the lines of a proposed extension of Phillips Street. On March 17, 1900, the Board conferred with officials of the city of Boston (Andrew J. Bailey, Esq., corporation counsel, Mr. John P. Dore, street commissioner, and Mr. F. O. Whitney, engineer of the street laying out department), in relation to the lay-out of this proposed extension of Phillips Street. At the date of the conference no funds were immediately available to the street laying out department for this work, and the necessary right of way for the construction of the connecting sewer through the Phillips Street extension has not yet been arranged.

A communication from Mr. E. W. Bowditch, chairman of the sewer commissioners of the town of Milton, was received Jan. 19, 1900; and conferences with Mr. Ellerton P. Whitney, a member of that board, were held on April 21 and May 19, 1900, in relation to the route of the high-level sewer through the town. A desirable route for the sewer, for a considerable distance within the town, is in private lands in Pine Tree and Unkety Brook valleys, following the natural line of drainage for accommodating the needs of the town. Some basis of co-operation between the town and this Board has been considered, so as to acquire the necessary rights of way with due regard to the interest of the town and its

drainage and highway facilities. The cost of acquiring the necessary rights of way through these valleys to provide for local drainage, as well as the rights of way for the high-level sewer, is being studied.

Mr. Nathaniel T. Kidder, chairman of the park commissioners of Milton, filed a request with this Board that the surplus earth from sewer trenches in the vicinity of Brook Road and Pine Tree Brook be deposited within the limits of a playground on Brook Road. The Board instructed the Chief Engineer to insert the necessary clause in the sewer specifications for effecting this disposal.

Land Takings.

The land takings made by the Board upon the high-level system include land in Hyde Park, Roxbury and West Roxbury, for work on contract sections 65, 66, 68, 69, 70, 71, 72, 73, 74 and 75. Takings have also been made for a pumping station in Roxbury, and for general purposes at Great Head, Hough's Neck, Quincy. These takings are as follows: —

On Oct. 13, 1899, two takings of land, one situated in Hyde Park in the county of Norfolk, the other in West Roxbury in the county of Suffolk, as shown on two plans. A portion of the taking in Hyde Park is taken in fee simple by the Commonwealth, and the remaining portion, as well as the West Roxbury land, in easement. The deed of land in Hyde Park is recorded with Norfolk Deeds, libro 855, folio 261; and that of land in West Roxbury with Suffolk Deeds, libro 2640, folio 70.

On April 14, 1900, two takings of land in Roxbury and West Roxbury. The taking in West Roxbury is recorded with Suffolk Deeds, libro 2678, folio 311; and that of land in Roxbury with Suffolk Deeds, libro 2678, folio 316.

On Sept. 17, 1900, a taking of land in South Street, West Roxbury, occasioned by a change in the route on Section 71. This taking was recorded with Suffolk Deeds, libro 2707, folio 321. On the same date a taking was made of land in Roxbury and West Roxbury, recorded with Suffolk Deeds, libro 2707, folio 322.

On Sept. 29, 1900, the Board executed a taking of a parcel of land located at Great Head, Hough's Neck, Quincy. Said deed is recorded with Norfolk Deeds, libro 880, folio 261.

Settlements.

The following settlements for land taken by the Board for the use of the high-level sewer have been made : —

On Oct. 5, 1899, William P. Richards of Boston, by deed recorded with Norfolk Deeds, libro 854, folio 166, quit-claimed to the Commonwealth the fee in a piece of land in Hyde Park, included within a taking made Oct. 13, 1899, and recorded with Norfolk Deeds, libro 855, folio 261.

On the same date (Oct. 5, 1899), William R. Richards and Elise B. Richards of Boston, by deed recorded with Norfolk Deeds, libro 854, folio 165, quit-claimed to the Commonwealth the fee in a piece of land in Hyde Park, included within a taking dated Oct. 13, 1899, and recorded with Norfolk Deeds, libro 855, folio 261.

George S. Lee, trustee of the Norfolk and Suffolk Real Estate Company, by deed dated Oct. 6, 1899, recorded with Norfolk Deeds, libro 854, folio 167, quit-claimed to the Commonwealth the fee in a piece of land in Hyde Park, under taking dated Oct. 13, 1899, and recorded with Norfolk Deeds, libro 855, folio 261.

By two deeds, each dated Oct. 20, 1899, recorded with Suffolk Deeds, libro 2640, folios 246 and 248, Frank C. Granger of Randolph quit-claimed to the Commonwealth rights, privileges and easements in two parcels of land in West Roxbury, both included within a taking dated Oct. 13, 1899, recorded with Suffolk Deeds, libro 2640, folio 70.

Louis H. Kelle of Boston, by deed recorded with Norfolk Deeds, libro 856, folio 98, released to the Commonwealth rights, privileges and easements in a parcel of land in Hyde Park, included within a taking dated Oct. 13, 1899, and recorded with Norfolk Deeds, libro 855, folio 261.

By deed dated Nov. 3, 1899, recorded with Norfolk Deeds, libro 857, folio 82, Christopher Fein released to the Commonwealth rights, privileges and easements in a parcel of land in Hyde Park, included in a taking made Oct. 13, 1899, and recorded with Norfolk Deeds, libro 855, folio 261.

David S. Allen of Boston, by deed dated Nov. 6, 1899, recorded with Suffolk Deeds, libro 2660, folio 558, released to the Commonwealth rights, privileges and easements in a parcel of land in West Roxbury included in a taking under date of Oct. 13, 1899, recorded with Suffolk Deeds, libro 2640, folio 70.

On Jan. 23, 1900, by deed recorded with Suffolk Deeds, libro 2660, folio 188, the Board obtained from Ruth H. and Edward W. E. Tompson the fee in a parcel of land, with the buildings thereon, located at the corner of Ward and Vancouver streets, Roxbury.

Alpheus P. Blake, trustee of the Metropolitan Land Company, by deed dated Oct. 28, 1899, recorded with Suffolk Deeds, libro 2642, folio 177, quit-claimed to the Commonwealth rights, privileges and easements in a parcel of land in West Roxbury, included within a taking made Oct. 13, 1899, recorded with Suffolk Deeds, libro 2640, folio 70.

On Dec. 29, 1899, by deed recorded with Suffolk Deeds, libro 2652, folio 138, John A. Scholz of Boston released to the Commonwealth rights, privileges and easements in a parcel of land in West Roxbury, under taking dated Oct. 13, 1899, and recorded with Suffolk Deeds, libro 2640, folio 70.

Settlement was made with Emilie Alexander of Hyde Park for damage to two parcels of land in Hyde Park, included within a taking made Oct. 13, 1899, and recorded with Norfolk Deeds, libro 855, folio 261.

On July 20, 1900, Sylvanus M. Parsons of Cambridge, by deed recorded with Suffolk Deeds, libro 2705, folio 253, quit-claimed to the Commonwealth rights, privileges and easements in land in West Roxbury, included within a taking made Oct. 13, 1899, recorded with Suffolk Deeds, libro 2640, folio 70.

On Feb. 17, 1900, an agreement was made between the Board and Frederick Bleiler of Boston for the lease of land at the corner of Heath and Day streets, Roxbury.

A claim has been filed for damage to the barn and grain elevator belonging to Willard P. Whittemore, occasioned by the construction of the Metropolitan sewer under a taking dated April 14, 1900, recorded with Suffolk Deeds, libro 2678, folio 311. No settlement has as yet been made.

High-level Pumping Station, Ward Street, Roxbury.

On March 24, 1900, the Chief Engineer submitted preliminary studies for the foundations and connections of the proposed high-level pumping station. These studies having been considered by the Board, the Chief Engineer was instructed to prepare detail studies embodying various suggestions and modifications. On April 21, 1900, the firm of Bacon & Mears, architects, submitted sketches for the proposed station buildings. The sketches were carefully examined by the Board and referred to the Chief Engineer for further detailed study.

Quincy Pumping Station.

Chapter 424, Acts of 1899, provides for the taking by this Board of the existing sewage pumping station and force-mains of the city of Quincy. The act does not specify the date on which the taking shall be made. In July, 1900, the Quincy sewer commissioners, through their engineer, applied for an early taking of the plant. On Aug. 30, 1900, the mayor of the city, one of the sewer commissioners, and their engineer, appeared before this Board in favor of an early transfer. The matter is still being considered by this Board.

NORTH METROPOLITAN SYSTEM.

Wakefield Extension.

Chapter 172, Acts of 1900, provides for the construction of a branch sewer for the central portion of the town of Wakefield, not previously included in the Metropolitan sewerage district. A copy of the act follows: —

[Chapter 172.]

An Act to provide for the addition of a part of the town of Wakefield to the north metropolitan sewerage system.

Be it enacted, etc., as follows:

Section 1. The territory of the town of Wakefield comprising that part of the town not now provided for in the metropolitan sewerage system is hereby added to the north metropolitan sewerage district, created by chapter four hundred and thirty-nine of the acts of the year eighteen hundred and eighty-nine, entitled "An Act to provide for the building, maintenance and operation of a system of sewage disposal for the Mystic and Charles River valleys." In becoming a part of the metropolitan system said addition shall be subject to the provisions and shall conform to the requirements of the aforesaid act and of acts in amendment thereof and in addition thereto, except as herein provided, and the proportionate liability incurred by said addition shall be assumed by the town of Wakefield. Any authority granted to other municipalities by said act or acts in amendment thereof and in addition thereto is also vested in said town of Wakefield.

Section 2. The metropolitan sewerage commissioners shall provide an outlet at the Wakefield town line for the additional sewage of said town, and acting on behalf of the Commonwealth shall construct a main trunk sewer through such parts of the cities of Melrose and Malden as may be necessary, to a point in the north metropolitan system at or near Barrett's pond, as said commissioners may determine, but at a point sufficiently below the grade of the main sewer from Melrose not to impede the flow of sewage from said sewer as it empties into the main sewer in Malden.

Section 3. In providing said outlet and in receiving sewage from said addition and said town of Wakefield, and in any action in relation thereto, and for the purpose of taking, constructing and maintaining said additional main lines of sewer, the said board of sewerage commissioners, acting on behalf of the Commonwealth, shall have and exercise all the authority conferred upon them by chapter four hundred and thirty-nine of the acts of the year eighteen hundred and eighty-nine and by acts in amendment thereof and in addition thereto regarding the original system or anything relating thereto, and all the provisions of said chapter are hereby made applicable to this additional taking and construction, except as herein otherwise provided.

Section 4. To meet the expenses incurred under the provisions of this act the treasurer and receiver general shall, with the approval of the governor and council, issue scrip or certificates of debt, in the name and behalf of the Commonwealth and under its seal, to an amount not exceeding one hundred and seventy-five thousand dollars, for a term not exceeding thirty years. Said scrip or certificates of debt shall be issued as registered bonds or with interest coupons attached, and shall bear interest at a rate not exceeding four per cent per annum, payable semi-annually on the first days of March and September in each year. Said interest and scrip or certificates shall be payable and when due shall be paid in gold coin or its equivalent. Said scrip or certificates of debt shall be designated on their faces, Metropolitan Sewerage Loan, shall be countersigned by the governor, and shall be deemed a pledge of the faith and credit of the Commonwealth, redeemable at the time specified therein in gold coin or its equivalent, and shall be sold and disposed of at public auction or in such other mode and at such times and prices and in such amounts and at such rate of interest, not exceeding four per cent per annum, as the treasurer and receiver general with the approval of the governor and council shall deem for the best interests of the Commonwealth. Any scrip or certificates of debt issued under the provisions of this act shall be considered as an addition to and shall become a part of the loan authorized by chapter four hundred and thirty-nine of the acts of the year eighteen hundred and eighty-nine, as amended by chapter three hundred and seven of the acts of the year eighteen hundred and ninety-four, and by chapter two hundred and ninety-four of the acts of the year eighteen hundred and ninety-five.

Section 5. The interest and sinking fund requirements of the moneys expended in constructing the part of the sewerage system as provided for in this act, and the cost of maintenance and opera-

tion thereof, shall be deemed and paid as a part of the interest, sinking fund requirements and costs specified in section fifteen of said chapter four hundred and thirty-nine, and the sinking fund established under the provisions of said chapter shall be a sinking fund for the extinguishment of the debt authorized by this act, said funds to be increased in the following manner: — The treasurer and receiver general shall from year to year, beginning with the year nineteen hundred, apportion to said sinking fund an amount sufficient with its accumulations to extinguish the debt at maturity; and in making the assessment for the increase of said sinking fund upon the several cities and towns liable thereto seven two hundred and fortieths of the whole amount shall be assessed in each of the first ten years, beginning with the year nineteen hundred, one thirtieth in each of the next ten years, beginning with the year nineteen hundred and ten, and the remainder shall be equally divided in the next ten years, beginning with the year nineteen hundred and twenty. Any premium realized from the sales of said scrip or certificates of debt shall be applied to the payment of the interest on said loan as it accrues.

Section 6. The commissioners to be appointed by the supreme judicial court under the provisions of section fourteen of chapter four hundred and thirty-nine of the acts of the year eighteen hundred and eighty-nine, for the purposes specified in said section, and any other commissioners thereafter appointed for said purposes, shall include the town of Wakefield among the cities and towns whose proportions are to be determined as provided in said section.

Section 7. The board of metropolitan sewerage commissioners, until the town of Wakefield has been included in a finding of commissioners appointed by the supreme judicial court, shall each year determine the amount to be paid by said town in that year as its fair share of the interest, sinking fund requirements and cost of maintenance and operation of said north metropolitan sewerage system, and the same shall be certified by the treasurer and receiver general and paid by said town as provided for payments of proportional parts of such interest, sinking fund requirements and costs by the other cities and towns in said district: *provided, however*, that no part of the cost of maintenance shall be assessed upon said town until its sewers are connected with the north metropolitan system as provided herein.

Section 8. This act shall take effect upon its acceptance by vote of a majority of the legal voters of said town of Wakefield present and voting thereon at a legal meeting called for that purpose. [*Approved March 23, 1900.*

In May, 1900, a communication was received from the town clerk of Wakefield, enclosing a copy of the vote, as required by section 8 of the act, to make the same effective, as follows: —

Voted, That the town accept the provisions of chapter 172 of the Acts of the General Court of the Commonwealth of Massachusetts for the year 1900, entitled "An Act to provide for the addition of a portion of the town of Wakefield to the North Metropolitan sewerage system."

The necessary studies and contract plans have been prepared for an early letting of this work.

In accordance with section 7 of the above act, the Board determined that $4,478.67 should be paid by the town of Wakefield into the treasury of the Commonwealth, as its fair share of the interest and sinking fund requirements for the year 1900.

The amount expended on the Wakefield extension has been $2,762.89 to date.

Chelsea and Everett, Additional Outlets.

Chapter 184, Acts of 1900, provides for the construction of additional outlets to meet the sewerage needs of Chelsea and Everett, within Snake or Mill Creek valley. A copy of the act follows: —

[Chapter 184.]

An Act to provide additional outlets for the sewage of the cities of chelsea and everett.

Be it enacted, etc., as follows:

Section 1. The board of metropolitan sewerage commissioners shall provide additional outlets for the sewage of the cities of Chelsea and Everett by extending the metropolitan sewer from its present terminus, near the junction of Eastern avenue and Willoughby street in Chelsea, to and across the boundary line between Chelsea and Everett, in the best manner to serve the sewerage needs of those districts of said cities which are situated in the valley of Snake or Mill creek.

Section 2. The cities of Chelsea and Everett and any persons and corporations may, subject to the control and under the direction of the said board, make connections with any sewers constructed by the board under the authority of this act.

Section 3. In providing said outlets and in receiving sewage from said districts, and in any action in relation thereto, and for the purpose of constructing and maintaining said additional main lines of sewer, the said board of sewerage commissioners, acting on behalf of the Commonwealth, shall have and exercise all the authority conferred upon them by chapter four hundred and thirty-nine of the acts of the year eighteen hundred and eighty-nine and by acts in amendment thereof and in addition thereto regarding the original system or anything relating thereto; and all the provisions of said chapter are hereby made applicable to this additional construction, except as herein otherwise provided.

Section 4. To meet the expenses incurred under the provisions of this act the treasurer and receiver general shall, with the approval of the governor and council, issue scrip or certificates of debt, in the name and behalf of the Commonwealth and under its seal, to an amount not exceeding ninety thousand dollars, for a term not exceeding thirty years. Said scrip or certificates of debt shall be issued as registered bonds or with interest coupons attached, and shall bear interest at a rate not exceeding four per cent per annum, payable semi-annually on the first days of March and September in each year. Said interest and scrip or certificates shall be payable, and when due shall be paid, in gold coin or its equivalent. Said scrip or certificates of debt shall be designated on their face, Metropolitan Sewerage Loan, shall be countersigned by the governor, and shall be deemed a pledge of the faith and credit of the Commonwealth, redeemable at the time specified therein, in gold coin or its equivalent, and shall be sold and disposed of at public auction or in such other mode and at such times and prices and in such amounts and at such rate of interest, not exceeding four per cent per annum, as the treasurer and receiver general with the approval of the governor and council shall deem for the best interests of the Commonwealth. Any scrip or certificates of debt issued under the provisions of this act shall be considered as an addition to and shall become a part of the loan authorized by chapter four hundred and thirty-nine of the Acts of the year eighteen hundred and eighty-nine, as amended by chapter three hundred and seven of the acts of the year eighteen hundred and ninety-four and by chapter two hundred and ninety-four of the acts of the year eighteen hundred and ninety-five.

Section 5. The interest and sinking fund requirements of the moneys expended in constructing that part of the sewerage system provided for in this act, and the cost of maintenance and operation thereof, shall be deemed and paid as a part of the interest,

sinking fund requirements and costs specified in section fifteen of said chapter four hundred and thirty-nine; and the sinking fund established under the provisions of said chapters shall be a sinking fund for the extinguishment of the debt authorized by this act, said funds to be increased in the following manner: — The treasurer and receiver general shall from year to year, beginning with the year nineteen hundred, apportion to said sinking fund, an amount sufficient with its accumulations to extinguish the debt at maturity; and in making the assessment for the increase of said sinking fund upon the several cities and towns liable thereto seven two hundred and fortieths of the whole amount shall be assessed in each of the first ten years, beginning with the year nineteen hundred, one thirtieth part in each of the next ten years, beginning with the year nineteen hundred and ten, and the remainder shall be equally divided in the next ten years, beginning with the year nineteen hundred and twenty. Any premium realized from the sale of said scrip or certificates of debt shall be applied to the payment of the interest on said loan as it accrues.

Section 6. This act shall take effect upon its passage. [*Approved March 30, 1900.*

The necessary surveys and contract plans have been made. Bids for the construction of this work, to be known as sections 56 and 57 of the North Metropolitan system, were received on Sept. 17, 1900. On September 24, contracts for both sections were executed with H. A. Hanscom & Co., the lowest bidders. The amount expended on this branch to date is $1,809.15.

On Sept. 17, 1900, the Board executed a taking of land in Chelsea and Everett, beginning at the northerly line of Willoughby Street at its intersection with Eastern Avenue, and taking all that portion of Eastern Avenue from the said point of intersection to the northerly line of Cabot Street at its junction with said avenue, to land belonging to Mary T. Sullivan; thence through Cabot Street, crossing Broadway and Clark Avenue, and passing through private land across Howard Street (proposed) to the middle of a creek, which is the supposed boundary line between said private land and land belonging to the Commonwealth, marked on said plan as belonging to the Metropolitan Park Commission; thence continuing through said land of the Metropolitan Park Commission, crossing a road called Parkway; thence through

East Avenue (proposed); thence through private land and Exeter Street (proposed) to Garfield Avenue; thence through Garfield Avenue, Bell Street, Washington Avenue and Springvale Avenue to the boundary line between Chelsea and Everett. Said taking is recorded with Suffolk Registry of Deeds, libro 2707, folio 324.

Additions to Existing Pumping Plants.

The trials contemplated in the contracts for these plants have been fully completed at all stations except Alewife Brook. The gross amounts of these contracts are as follows: —

Deer Island station,	$27,200 00
East Boston station,	25,600 00
Charlestown station,	25,800 00
Alewife Brook station,	7,500 00
	$86,100 00

Of this total, $76,365 has been paid on account, leaving unpaid balances amounting to $9,735.

Chapter 175, Acts of 1897, provides for the licensing, by the building commissioner of the city of Boston, of steam boilers and engines erected within the limits of the city. Permits for the additional boilers and engines at the above stations within the city limits were not secured, on the advice of the Attorney-General that this Board, as the agent of the Commonwealth, was not contemplated in the act.

Contracts.

Attention is called to the tables in the Appendix, which include lists of contracts upon the North Metropolitan system during the year. Among these are bids for construction of sections 56 and 57, the furnishing of coal for the pumping stations, sewer pipe, man-hole frames and covers and other iron work.

Settlements.

As noted in the last report, suit had been brought by the John Booth Company, contractors for Section 50, Wakefield branch, for compensation on account of extra rock excava-

tion. On Dec. 2, 1899, notice was received from the Attorney-General that the case had been tried before three justices of the Superior Court, and that the finding was in favor of the Commonwealth.

The case of the Commonwealth *v.* Charles Linehan, contractor for the construction of Section 11, Chelsea, to recover an amount paid to the city of Chelsea (eleventh report, page xiv), was settled by compromise in the sum of $800.

The case of Penney *v.* the Commonwealth for damage to land and crops in North Cambridge, occasioned by the construction of the Metropolitan sewer in lands within a taking dated Jan. 7, 1893, has been pending for several years. In January, 1900, damages to the amount of $1,979.69 were paid by agreement.

By deed dated Jan. 5, 1900, the heirs of the late Amos Stone released to the Commonwealth rights, privileges and easements in a parcel of land in Everett, being all the land of said grantors included within a taking made Aug. 17, 1891, and recorded with Middlesex South District Deeds, libro 2064, folio 142.

Connections authorized during the Year on the North Metropolitan System.

In the year ending Sept. 30, 1900, 53 connections were authorized on this system, distributed as follows: Arlington, 14; Boston (Charlestown district), 2; Chelsea, 2; Everett, 1; Malden, 11; Medford, 3; Melrose, 17; Winchester, 2; Winthrop, 1.

A statement covering all connections with this system, made or authorized to the date of this report, will be found in Table J of the Appendix.

Expenditures.

The expenditures for construction upon the North Metropolitan system, including the Wakefield, Stoneham, Everett and Lexington branches and the Chelsea and Everett additional outlets, during the year ending Sept. 30, 1900, amount to $54,876.69. This, with $5,262,397.68 previously reported, makes a total expenditure on this system of $5,317,274.37 to date.

Receipts.

The amount of receipts from sales, etc., for the year ending Sept. 30, 1900, is $863.60. The items are as follows: sale of coal and oil, $36.27; use of water, $54.15; changing man-holes, $87.15; pumping salt water, $282.85; receiving surface drainage from the Everett system into the Metropolitan sewer, $100; repairing fences and grounds, $45.91; inspection of pile driving, $78; sale of junk, $101.47; rental of land, $75; sale of filling and ashes, $2.80.

CHARLES RIVER VALLEY SYSTEM.

On March 3, 1900, this Board was notified by Messrs. H. Barker & Co. of an overflow from the Metropolitan sewer into their starch factory, in Watertown. On March 30, 1900, the Board received notice from the board of selectmen of Watertown that the water in the Metropolitan sewer was backing up into cellars in that town. This Charles River system is tributary to the main drainage system of the city of Boston, connecting therewith at the intersection of Gainsborough Street and Huntington Avenue; the sewers are kept free by the action of pumps at the main drainage pumping station. At the two dates named above there were heavy rain-storms, accompanied by unusually high tides, and the pumping capacity was not sufficient to remove the flow of sewage, with the result of surcharging the main drainage sewer and the Charles River system. As these causes were beyond the control of the Board, no liability was assumed, and the matter was referred to the street department of the city of Boston. The high-level sewer, now in process of construction, is designed to relieve the Charles River system from similar conditions of back-water.

Chapter 464, Acts of 1900, provides for the purchase by the Commonwealth of the Watertown siphon, under the Charles River, and is as follows: —

[Chapter 464.]

An Act to authorize and direct the board of metropolitan sewerage commissioners to refund to the town of Watertown the cost of a siphon under the Charles River.

Be it enacted, etc., as follows:

Section 1. The board of metropolitan sewerage commissioners is hereby authorized and directed to pay to the town of Watertown the sum of ninety-six hundred dollars, with interest thereon at the rate of four per cent per annum from the first day of April in the year eighteen hundred and ninety-seven; said sum having been paid by the town of Watertown for a siphon with connected struct-

ures constructed under the direction of said board, extending under the Charles river from the eastern part of said town to the main sewer of the Charles river valley system of sewage disposal. Said siphon shall hereafter form a part of the south metropolitan system of sewers.

Section 2. To provide for the payment of the aforesaid sum the treasurer and receiver general shall, with the approval of the governor and council, issue scrip or certificates of debt, in the name and behalf of the Commonwealth and under its seal, to such amount as may be necessary, for a term not exceeding forty years from the date thereof. The scrip or certificates of debt so issued shall be construed as an addition to and shall become a part of the loan authorized by chapter four hundred and thirty-nine of the acts of the year eighteen hundred and eighty-nine; and the sinking fund established under the provisions of said chapter shall be a sinking fund for the extinguishment of the debt authorized by this act. The interest and sinking fund requirements of said debt and the cost of maintenance and operation of said siphon shall be assessed upon the cities and towns of the south metropolitan district in the manner provided by chapter four hundred and twenty-four of the acts of the year eighteen hundred and ninety-nine.

Section 3. This act shall take effect upon its passage. [*Approved July 16, 1900.*

Under the provisions of this act, the sum of $10,912 was paid the town of Watertown in August, 1900.

A 10-inch connection with this system was authorized on Dec. 2, 1899, located on the south-westerly side of the Metropolitan sewer, at the corner of Worthington Street extension and the Fenway, city of Boston.

A statement covering all connections with this system, made or authorized to the date of this report, will be found in Table J of the Appendix.

NEPONSET VALLEY SYSTEM.

The following settlements for land taken upon this system were made during the past year: —

On Oct. 11, 1899, Emery W. Smith, by Frank A. Townsend, mortgagee, released the Commonwealth from all claims for damage to his land in Hyde Park, caused by the construction of the Metropolitan sewer therein, under taking dated June 13, 1896.

On Oct. 28, 1899, John T. Cunningham of Boston released to the Commonwealth rights, privileges and easements in a parcel of land in West Roxbury included within a taking made June 5, 1897.

On Dec. 14, 1899, the Boston Home Building Association released the Commonwealth from all claims for damage to land in West Roxbury, caused by the construction of the Metropolitan sewer under taking dated June 5, 1897.

By a release dated Oct. 7, 1899, William G. Baker and William H. Cushman, trustees of the West Roxbury Heights Land Company, quit-claimed to the Commonwealth rights, privileges and easements in a parcel of land in West Roxbury, being land included within a taking made June 5, 1897.

On March 12, 1900, Seman Klous of Hyde Park executed a release for land in Hyde Park, included within a taking made March 28, 1896.

By agreement, $12,429.01 was paid J. Eugene Cochrane for damage to property in Dedham, included within a taking made by this Board, June 13, 1896.

Connections authorized during the Year on the Neponset Valley System.

A statement covering all connections with this system, made or authorized to the date of this report, will be found in Table J of the Appendix.

Expenditures.

The expenditures upon the Neponset valley system for the year ending Sept. 30, 1900, have been $13,237.75, which, with $840,444.73 previously reported, makes a total of $853,682.48 expended on this system to date.

GENERAL.

The South Metropolitan district was created by chapter 424, Acts of 1899, section 16 of which provides for the appointment, by the Supreme Judicial Court, at intervals of five years, of a commission to apportion the cost of construction, maintenance and operation of Metropolitan sewers among the cities and towns of the district. With the object of considering matters of general interest in relation to the apportionment, the Board, on Thursday, March 22, 1900, gave a hearing to the officials of the contributory cities and towns. On March 30, 1900, the Supreme Judicial Court appointed Frederick W. Dallinger of Cambridge, Walter Clifford of New Bedford and Larkin T. Trull of Lowell as the members of this apportionment commission. Their report is appended: —

COMMONWEALTH OF MASSACHUSETTS.

SUPREME JUDICIAL COURT.

SUFFOLK, ss. IN EQUITY, No. 6923.

HOSEA KINGMAN AND OTHERS, METROPOLITAN SEWERAGE COMMISSIONERS, PETITIONERS.

In re THE SOUTH METROPOLITAN SEWERAGE SYSTEM, *St. 1899, c. 424.*

REPORT AND AWARD.

This is a petition for the appointment of commissioners under the provisions of section 16 of chapter 424 of the Acts of the year 1899, being entitled "An Act to provide for the construction of a high-level gravity sewer for the relief of the Charles and Neponset River valleys," for the purpose of apportioning the cost of construction, maintenance and operation of the South Metropolitan sewerage system among the cities and towns comprising that system.

In order to arrive at a clear idea of the duty of the commissioners under this act and petition, it may be well to review briefly the history of the Metropolitan sewerage system. The original act, St. 1889, c. 439, which was based on the report of the State Board of Health, authorized the construction, maintenance and operation by the Commonwealth of two systems of public sewers

for the Metropolitan district, extending through the Mystic River valley and the Charles River valley to tide water. With the Mystic River main sewer commencing in the town of Stoneham and discharging into the sea at Deer Island, and known as the North Metropolitan system, this present commission has nothing to do.

The Charles River System.

The Charles River system of sewage disposal, as created by St. 1889, c. 439, includes the Brighton district and part of the Back Bay section of the city of Boston, the cities of Newton and Waltham and the towns of Brookline and Watertown. This system, which was completed in the spring of 1892, and has been in operation from that date to the present time, begins at the lower line of Waltham and extends along the southerly bank of Charles River to the intersection of Gainsborough Street with Huntington Avenue in the city of Boston, thence discharging through the Boston main sewer into the sea at Moon Island. For pumping and discharging the sewage of this system an annual rental is paid by the Commonwealth to the city of Boston, the amount of this rental being determined under the provisions of St. 1897, c. 502.

To provide for the cost of construction of both this system and the North Metropolitan system, the statute before referred to authorized an issue by the Commonwealth of its scrip or certificates of debt, to be designated on the face thereof as the Metropolitan Sewerage Loan, for a term not exceeding forty years, and to an amount not to exceed $5,000,000. By subsequent statutes additional loans have been authorized, as follows: by St. 1894, c. 307, $500,000; by St. 1895, c. 294, $300,000; by St. 1896, c. 414, $30,000; by St. 1897, c. 88, $5,000; by St. 1897, c. 436, $10,000; by St. 1897, c. 520, $70,000; by St. 1898, c. 215, $60,000; by St. 1898, c. 424, $155,000; by St. 1900, c. 172, $175,000; by St. 1900, c. 184, $90,000; making a total authorized issue of $6,395,000 for two systems. All of these bonds bear interest at the rate of 3 per cent. per annum, except $80,000 issued in June, 1897, and $215,000 issued in June, 1898, which bear interest at the rate of 3½ per cent. They all mature in 1930.

The original act provided for a single sinking fund for both systems. But, although only one loan and one sinking fund have been thus provided for the construction of both systems, the cost of construction of each system has been kept separately in the accounts by the Metropolitan Sewerage Commissioners. The total cost of construction of the Charles River system to date has been $789,134.27.

The Neponset Valley System.

By St. 1895, c. 406, the Board of Metropolitan Sewerage Commissioners was authorized to construct, maintain and operate a system of sewage disposal for the Neponset River valley. This system provides for parts of the West Roxbury and Dorchester districts of the city of Boston, and the towns of Dedham, Hyde Park and Milton. The sewage enters the Boston main drainage system at Granite Avenue in Dorchester, and, as in the case of the Charles River system, an annual rental is paid to the city of Boston by the Commonwealth for the expenses of its pumping and discharge.

To meet the expenses of constructing this system, the original act provided for a State loan of $500,000, on the same terms and conditions as in the case of the North Metropolitan and Charles River systems. By subsequent statutes additional loans for the completion of this system have been authorized, as follows: by St. 1897, c. 83, $300,000; by St. 1898, c. 180, $35,000; by St. 1899, c. 241, $25,000; making a total authorized issue of $860,000. All of these bonds bear interest at the rate of 3 per cent., except the $300,000 issued under St. 1897, c. 83, which bears interest at the rate of 3½ per cent. The total cost of this system to date is $852,873.74.

The statute establishing the Neponset valley system (St. 1895, c. 406) created a new sinking fund, separate and distinct from that for the North Metropolitan and Charles River systems, created by St. 1889, c. 439. By St. 1899, c. 122, however, the two sinking funds were consolidated into one sinking fund, to be known as the Metropolitan Sewerage Loans Sinking Fund.

The New High-level Gravity Sewer.

As has been stated above, both the Charles River and the Neponset valley system discharge their sewage through the city of Boston outfall sewer at Moon Island. With the rapid growth of population, the Boston main drainage works, designed only for the needs of the city, soon became taxed to their utmost capacity, and something had to be done. Accordingly, by chapter 4 of the Resolves of 1898, the Board of Metropolitan Sewerage Commissioners was directed to investigate the matter. This the Board did, and in an exhaustive report to the Legislature of 1899 recommended the construction of a new high-level gravity sewer for the relief of the Charles and Neponset River valleys. Based on this report, St. 1899, c. 424, was passed, providing for the construction of such a high-level sewer, and authorizing a loan of $4,600,000,

the bonds to run for forty years, and bearing interest at a rate not to exceed 4 per cent. Of this amount, $1,000,000 has been issued to date, bearing interest at the rate of 3 per cent., and maturing in 1939. Of the proceeds of the bonds, $216,229.65 has already been expended on the work.

This new system, which is now under construction, is designed to provide for important districts in Roxbury, West Roxbury and Dorchester, in the city of Boston and the city of Quincy. It will also intercept the sewage now discharged into the Boston main drainage system from the Charles River and Neponset valley systems, and convey the entire volume to a new harbor outlet off Nut Island.

Apportionment of Cost of Construction and Maintenance.

Although the cost of construction and maintenance of the Metropolitan sewerage systems in the first instance has been borne by the Commonwealth, all the sewerage acts have provided that the interest and sinking fund requirements and the annual cost of maintenance and operation shall be assessed upon the different cities and towns comprising the district, and paid by them as part of their quota of the annual State tax. The proportion which each city and town in the district has to pay of the total annual amount required to meet the interest and sinking fund requirements and the cost of maintenance and operation has always been determined by three commissioners, appointed by the Supreme Judicial Court, whose award stands for five years, when another apportionment is made in a similar manner.

The first commission, which was appointed under St. 1889, c. 439, in May, 1891, to make such an apportionment for the North Metropolitan and Charles River systems for the first term of five years, from 1891 to 1895, inclusive, consisted of Ebenezer R. Hoar, William C. Endicott and John E. Sanford. A second commission, consisting of Edmund H. Bennett, John E. Sanford and Everett C. Bumpus, was appointed Oct. 9, 1895, under St. 1889, c. 439, and supplementary acts, to make such apportionment for the North Metropolitan and Charles River systems for the second term of five years, from 1896 to 1900, inclusive; and on Dec. 16, 1895, the same commissioners were appointed, under St. 1895, c. 406, to make a similar apportionment for the Neponset valley system for the first term of five years, the period being the same in both cases. The awards of these commissioners, which were made in November, 1891, and October, 1896, respectively, were duly accepted by the court and complied with by the several cities and towns.

On March 27, 1900, the undersigned, Frederick W. Dallinger, Walter Clifford and Larkin T. Trull, by an order of the Supreme Judicial Court, under the above petition, were appointed the commissioners to make a similar apportionment for the new South Metropolitan system, created by St. 1899, c. 424. Section 16 of the statute referred to provides that the commissioners "shall, after due notice and hearing and in such manner as they shall deem just and equitable, determine the proportion in which each of the cities and towns hereinbefore named shall annually pay money into the treasury of the Commonwealth for the term of five years next after the year of the first issue of said scrip or certificates, to meet the interest and sinking fund requirements for each of said years, as estimated by said treasurer, and to meet the cost of maintenance and operation of said system for each of said years, as estimated by the said board and certified to said treasurer, and any deficiency in the amount previously paid in, as found by said treasurer, and shall return their award into said court."

In accordance with the above, after receiving notice of our appointment, we met and assigned a time and place for hearing all parties interested in the premises, and gave due notice thereof to the cities and towns named in the act and petition, viz., the cities of Boston, Newton, Quincy and Waltham, and the towns of Brookline, Dedham, Hyde Park, Milton and Watertown. Notice was also given to the Board of Metropolitan Sewerage Commissioners and to the Attorney-General. Hearings were held at Room 436, State House, on April 14, April 21 and April 28, at which all of the cities and towns before mentioned appeared by their proper officers, solicitors or counsel, and offered whatever evidence or arguments they desired to offer; and they all have been publicly heard by all of us sitting together, as fully as they or any of them desired. The Metropolitan Sewerage Commissioners and their engineer and clerk have also appeared before us or have met with us from time to time, and have furnished us such information as we desired in regard to the facts involved in the matter under consideration.

The New South Metropolitan System.

At the very outset we were confronted with the question of the interpretation of the act of 1899 (c. 424). At first sight it might seem that since the passage of the statute just mentioned there are three distinct systems, viz.: the Charles River valley system, the Neponset valley system and the new high-level system. A careful examination of the wording of the statute, however, plainly

shows that it was the intention of the Legislature to do away with the old Charles River valley and Neponset valley systems as separate systems, and unite them with certain other territory into a new system, to be known as the South Metropolitan system. Section 1 of the act provides that "the board of metropolitan sewerage commissioners shall, for the purpose of constructing, maintaining and operating a system of sewage disposal *for the south metropolitan system as hereinafter defined*, construct, maintain and operate," etc. Section 2 of the act then goes on to define the new district as follows: —

The south metropolitan system shall include the present Charles river valley metropolitan sewerage district, comprising a part of Boston, the cities of Newton and Waltham, and the towns of Watertown and Brookline; the present Neponset valley metropolitan sewerage district, comprising a part of Boston and the towns of Dedham, Hyde Park and Milton; also Quincy and such portion of Dorchester, Roxbury and West Roxbury as are not included in the present metropolitan sewerage areas, and as are so situated as to be drained into the proposed high-level sewer substantially as outlined on maps contained in the special report of the metropolitan sewerage commissioners to the general court of eighteen hundred and ninety-nine.

That it is the plain intention of the statute to abolish the two old systems and to start afresh, as it were, with a new system composed of the drainage areas of the two existing systems, together with the other areas mentioned above, is still further shown by section 15 of the act, which reads as follows: —

The interest and sinking fund requirements and the cost of maintenance and operation of the Charles river system, incurred under the provisions of chapter four hundred and thirty-nine of the acts of the year eighteen hundred and eighty-nine, and the interest and sinking fund requirements and the cost of maintenance and operation of the Neponset river system, incurred under the provisions of chapter four hundred and six of the acts of the year eighteen hundred and ninety-five, and of acts in amendment thereof, *shall be assessed upon the cities and towns of the south metropolitan district* as hereinafter provided.

In other words, the amount already expended for the cost of construction of the two old systems, less what has been repaid to the Commonwealth by the several cities and towns in those systems, together with the total cost of the new high-level gravity sewer (estimated at $4,600,000), *is to be assessed upon all the cities and towns included within the new South Metropolitan district* "in such manner" as the commissioners appointed by the Supreme Judicial Court "shall deem just and equitable."

Basis of Apportionment.

In regard to the basis of apportionment, various methods were suggested by counsel, among which may be mentioned the apportionment of both cost of construction and the expense of maintenance among the several cities and towns according to their assessed valuation of real and personal property without regard to population; the apportionment of the same according to population without regard to valuation; and, finally, an apportionment according to a percentage for each municipality, made up by combining its percentage of valuation and its percentage of the population of the entire district, and dividing the result by two. It was also suggested by counsel that the proportion which each city and town should contribute towards the cost of construction of the system should be proportional to the distance between the point of entrance of its sewage into the main trunk sewer and the harbor outlet. While at first sight there is a certain element of fairness in this last proposition, the result of its application would be a crushing burden on the inland cities and towns. Moreover, such a method of apportionment would be contrary to the established policy of the Commonwealth in regard to paying for similar public works.

The Metropolitan sewerage system was established in the interest of the public health of the people of the entire Metropolitan district. If there were no city or town lines, the people of the district would undoubtedly be called upon to pay for this system of sewage disposal according to their ability, *i.e.*, according to their property. There does not seem, on the whole, to be any fairer method of assessing the cost of construction of great public undertakings of this kind than that of assessing such cost on the various cities and towns according to their taxable valuation. On the other hand, it is undoubtedly true that after construction the use made of the sewerage system by each city and town depends upon the number of inhabitants in such city and town; and, as the cost of maintenance and operation is directly proportional to the amount of sewage discharged, *i.e.*, the use made of the system, it would seem that the basis of population would be a just and equitable method of assessing such expense.

Accordingly, we have determined to apportion the payments required to meet the interest and sinking fund requirements of the sewerage loans, which represent the cost of construction of the system, upon the basis of taxable valuation; and the payments required to meet the annual cost of maintenance and operation, upon the basis of population. We have used the valuations given in St. 1898, c. 232, and have taken the population of the

different cities and towns from the State census of 1895. It may be well to note that all the cities and towns in the South Metropolitan system, as represented at the different hearings, admitted the correctness of these figures.

Award.

1. Interest and Sinking Fund Requirements.

We therefore determine and award that the several cities and towns in the South Metropolitan district shall annually pay money into the treasury of the Commonwealth for the term of five years, 1900 to 1904, both inclusive, to meet the interest and sinking fund requirements for each of said years, as estimated by said Treasurer, of the Metropolitan Sewerage Loan authorized and issued for the construction of said South Metropolitan system, including the interest and sinking fund requirements of the former Charles River valley and Neponset valley systems, so called, and any deficiency in the amount previously paid in, as found by said Treasurer, in the proportions shown in the right-hand column of the following table: —

Table showing the Proportions in which the Several Cities and Towns in the South Metropolitan System shall pay Money to meet the Interest and Sinking Fund Requirements under St. 1899, c. 424.

City or Town.		Valuation.	Proportion (Per Cent.).
Waltham,		$19,627,274	5.08
Watertown,		10,282,882	2.66
Newton,		59,103,233	15.30
Boston: —			
Brighton district,	$28,726,000		
Back Bay district,	31,859,500		
Roxbury district,	33,704,900		
West Roxbury district,	32,237,100		
Dorchester district,	37,262,800		
Total for Boston (in the South Metropolitan district),		163,790,300	42.42
Brookline,		74,251,728	19.23
Dedham (excluding Westwood),		8,241,000	2.13
Hyde Park,		9,729,118	2.52
Milton,		22,192,943	5.75
Quincy,		18,945,036	4.91
Total,		$386,163,514	100.00

2. Cost of Maintenance and Operation.

We determine and award that the several cities and towns in the South Metropolitan system shall annually pay money into the treasury of the Commonwealth for the term of five years, 1900 to 1904, both inclusive, to meet the cost of maintenance and operation of said systems for each of said years, as estimated by the Board of Metropolitan Sewerage Commissioners, and certified to said Treasurer, and any deficiency in the amount previously paid in, as found by said Treasurer, in the proportions shown in the following table : —

Table showing the Proportions in which the Cities and Towns in the South Metropolitan System shall annually pay Money to meet the Cost of Maintenance and Operation of Said System under St. 1899, c. 424.

City or Town.		Population, 1895.	Proportion (Per Cent.).
Waltham,		20,876	10.14
Watertown,		7,788	3.78
Newton,		27,590	13.41
Boston : —			
Brighton district,	14,997		
Back Bay district,	11,500		
Roxbury district,	22,600		
West Roxbury district,	15,000		
Dorchester district,	25,000		
Total for Boston (in the South Metropolitan district),		89,097	43.30
Brookline,		16,164	7.86
Dedham (excluding Westwood),		6,195	3.02
Hyde Park,		11,826	5.75
Milton,		5,518	2.68
Quincy,		20,712	10.06
Total,		205,766	100.00

Frederick W. Dallinger,
Walter Clifford,
Larkin T. Trull,
Apportionment Commissioners.

Boston, June 1, 1900.

DISBURSEMENTS BY YEARS TO SEPT. 30, 1900.

	Year ending Sept. 30, 1889.	Year ending Sept. 30, 1890.	Year ending Sept. 30, 1891.	Year ending Sept. 30, 1892.
Office expenses,	$1,161 29	$28,792 85	$30,437 29	$31,220 76
North Metropolitan system,	-	116,492 55	582,966 06	962,798 49
Charles River valley system,	-	18,329 41	381,149 33	280,308 29
Both systems,	-	2,696 20	5,597 86	7,703 15
Neponset valley system,	-	-	-	-
Wakefield branch,	-	-	-	-
Stoneham branch,	-	-	-	-
Everett branch,	-	-	-	-
Lexington branch,	-	-	-	-
Wakefield branch extension,	-	-	-	-
Chelsea and Everett outlets,	-	-	-	-
High-level sewer investigation,	-	-	-	-
High-level sewer,	-	-	-	-
	$1,161 29	$166,311 01	$1,000,150 54	$1,282,030 69

DISBURSEMENTS BY YEARS TO SEPT. 30, 1900 — Continued.

	Year ending Sept 30, 1893.	Year ending Sept. 30, 1894.	Year ending Sept. 30, 1895.	Year ending Sept. 30, 1896.
Office expenses,	$35,191 97	$33,669 39	$19,652 19	-
North Metropolitan system,	1,172,269 02	1,115,190 19	606,488 61	$191,312 02* 209,037 56
Charles River valley system,	28,882 27	25,369 13	1,927 35	19,070 59 33,760 94*
Both systems,	12,783 61	15,864 20	302 20	-
Neponset valley system,	-	-	2,649 95	200,604 35
Wakefield branch,	-	-	-	125 98
Stoneham branch,	-	-	-	-
Everett branch,	-	-	-	-
Lexington branch,	-	-	-	-
Wakefield branch extension,	-	-	-	-
Chelsea and Everett outlets,	-	-	-	-
High-level sewer investigation,	-	-	-	-
High-level sewer,	-	-	-	-
	$1,249,126 87	$1,190,092 91	$631,020 30	$428,838 48

* The accounts "Office expenses" and "Both systems" are charged off to the North Metropolitan system and the Charles River valley system, — 85 per cent. to the former and 15 per cent. to the latter (North Metropolitan system, $191,312.02; Charles River valley system, $33,760.94). This is the proportion made by the apportionment commission in 1891, and has been found by experience to be substantially correct.

DISBURSEMENTS BY YEARS TO SEPT. 30, 1900 — Concluded.

	Year ending Sept. 30, 1897.	Year ending Sept. 30, 1898.	Year ending Sept. 30, 1899.	Year ending Sept. 30, 1900.	Totals.
Office expenses,	-	-	-	-	-*
North Metropolitan system,	$42,023 27	$9,785 61	$83,385 64	$50,304 65	$5,142,053 67
Charles River valley system.	325 21	11 75	-	10,912 00	800,046 27
Both systems,	-	-	-	-	-*
Neponset valley system,	405,486 31	212,861 71	18,842 41	13,237 75	853,682 48
Wakefield branch,	27,199 11	8,281 36	5 84	-	35,612 29
Stoneham branch,	2,802 68	8,764 70	6 72	-	11,574 10
Everett branch,	-	4,574 73	50,302 39	-	54,877 12
Lexington branch,	-	56,583 69	12,001 46	-	68,585 15
Wakefield branch extension.	-	-	-	2,762 89	2,762 89
Chelsea and Everett outlets.	-	-	-	1,809 15	1,809 15
High-level sewer investigation.	-	11,810 52	13,867 44	-	25,677 96
High-level sewer,	-	-	18,930 50	347,302 48	366,232 98
	$477,836 58	$312,674 07	$197,342 40	$426,328 92	$7,362,914 06

Total expended to Sept. 30, 1900, ... $7,362,914 06

* The accounts "Office expenses" and "Both systems" are charged off to the North Metropolitan system and the Charles River valley system, — 85 per cent. to the former and 15 per cent. to the latter (North Metropolitan system, $191,312.02; Charles River valley system, $33,760.94). This is the proportion made by the apportionment commission in 1891, and has been found by experience to be substantially correct.

A communication was received from Walter S. Allen, secretary to the Board of Paris Exposition Managers for Massachusetts, requesting this commission to furnish an exhibit for the exposition. In response thereto, the Board caused to be prepared a large wall map and enlarged photographs, showing important constructional and structural features of the Metropolitan works, together with a set of the annual reports of the Board, as also a pamphlet, for gratuitous distribution, containing historical and descriptive data relating to the main drainage of the city of Boston and its Metropolitan district. This exhibit was awarded a gold medal.

Chapter 382, Acts of 1900, requires the removal of the building No. 1 Mount Vernon Street, which has been occupied by this Board since May 1, 1896. New offices have been secured on the ninth floor of the Pemberton building,

Pemberton Square, and a lease executed for a term of five years. The removal to these offices will take place early in January, 1901.

ORGANIZATION.

Tilly Haynes, whose term as a commissioner expired in January of this year, was reappointed for three years.

Hon. Hosea Kingman of Bridgewater, who had held the office of chairman since the organization of the Board in 1889, died on March 29, 1900, after a brief illness.

At a meeting of the Board, held Saturday, March 31, 1900, the following resolutions were unanimously adopted: —

Whereas, The surviving members of this Board realize with deep regret the loss by death of their chairman, Hon. Hosea Kingman of Bridgewater; and

Whereas, Hosea Kingman had presided with conspicuous ability over the deliberations of this Board since its organization in 1889; and

Whereas, In that capacity he made a careful and thorough study of every question brought to his notice. He was fair and impartial in all his conclusions, and placed at the disposal of the Commonwealth a matured judgment, professional and business ability of the highest degree, and a conscientious regard for the important duties confided to his charge.

Resolved, That by the death of Hosea Kingman this department of the Commonwealth has lost an exceptionally able, zealous and conscientious public servant.

Resolved, That, while deploring the public loss sustained by his untimely decease, we would give expression to our own sense of personal affliction in the removal of a valued colleague, with whom it was our privilege to associate on terms of affectionate and respectful intimacy.

Resolved, That the foregoing be spread upon the records of the Board, and a copy thereof transmitted to the family of our departed friend.

James A. Bailey, Jr., of Arlington, was appointed as Mr. Kingman's successor, and, after qualifying, took his seat as a member of the Board on the twenty-eighth day of April, and was chosen chairman thereof.

The Appendix contains tables showing in detail the receipts and expenditures for the year, also the assets and liabilities to date.

JAMES A. BAILEY, Jr.,
TILLY HAYNES,
GEORGE A. KIMBALL,
Metropolitan Sewerage Commissioners.

Boston, Oct. 1, 1900.

REPORT OF CHIEF ENGINEER

AND

SUPERINTENDENT.

MAP OF METROPOLITAN SEWERAGE DISTRICT

James A. Bailey Jr.
Tilly Haynes
George A. Kimball
} METROPOLITAN SEWERAGE COMMISSIONERS

Wm. M. Brown Jr. CHIEF ENGR.

BOSTON, MASSACHUSETTS, SEPT. 30, 1900.

LIMIT OF METROPOLITAN SEWERAGE DISTRICT INDICATED THUS

COMPLETED METROPOLITAN SEWERS INDICATED THUS

PROPOSED HIGH LEVEL AND NORTH METROPOLITAN SEWERS..... INDICATED THUS

HIGH LEVEL AND NORTH METROPOLITAN SEWERS UNDER CONTRACT INDICATED THUS

FORCE MAINS CONNECTING WITH HIGH LEVEL SEWER INDICATED THUS

BOSTON MAIN DRAINAGE SEWERS INDICATED THUS

AREAS SEWERED BY COMBINED SYSTEM AND CONTRIBUTING SEWAGE TO METROPOLITAN SEWERS TO DATE SHADED THUS

AREAS SEWERED BY SEPARATE SYSTEM AND CONTRIBUTING SEWAGE TO METROPOLITAN SEWERS TO DATE SHADED THUS

AREAS OF SEWERAGE DISTRICT

NORTH METROPOLITAN AREA	85 SQ. MILES
SOUTH METROPOLITAN AREA	102 SQ. MILES
TOTAL AREA INCLUDING WATER SURFACES	187 SQ. MILES

NOTE

ELEVATIONS ARE REFERRED TO A DATUM WHICH IS 100 64/100 FT. BELOW MEAN LOW WATER OF BOSTON HARBOR AND 100 FT. BELOW BOSTON CITY BASE

SCALE OF MILES.

SCALE OF METERS.

REPORT OF CHIEF ENGINEER

AND

SUPERINTENDENT.

Boston, Sept. 29, 1900.

James A. Bailey, Jr., Tilly Haynes, George A. Kimball,
Metropolitan Sewerage Commissioners.

Gentlemen: — The following report concerning the metropolitan sewerage systems for the year ending Sept. 29, 1900, is respectfully submitted.

Chapter 172 of the legislative Acts of 1900 provided for an extension of the North Metropolitan sewerage district by the inclusion of that part of the town of Wakefield not previously a part of the metropolitan area. The villages of Greenwood and Boyntonville, forming the southerly section of the town, had been added by chapter 414 of the Acts of 1896, and the effect of the later act is to add the remainder of the town, including the central village, amounting in all to 6.7 square miles. At the date of the eleventh annual report the North Metropolitan district included an area of about 78 square miles; it has, therefore, been enlarged by the Wakefield extension to nearly 85 square miles.

The metropolitan area lying mainly south of the Charles River, including the original Charles River valley and Neponset River valley systems, together with portions of Dorchester, Roxbury and West Roxbury of the city of Boston and the city of Quincy, was formed into a South Metropolitan district by chapter 424 of the Acts of 1899, as more particularly detailed in the eleventh annual report, pages 4 and 5.

As outlined above, the South Metropolitan district embraced so much of the original area of the town of Dedham as was included by the second apportionment commission in the award of Oct. 16, 1896. In the award of the first apportionment commission for the South Metropolitan district, dated June 1, 1900, that portion of the original area of Dedham now forming the present town of Westwood, incorporated under the provisions of chapter 226 of the Acts of 1897, *i.e.*, subsequent to the date of the earlier apportionment, was excluded from the metropolitan area. The effect of

the rearrangement of boundaries resulting from this award is to reduce the area of the South Metropolitan district from 107 to 102 square miles.

The area of the entire metropolitan district, including water surfaces, at the date of this report, is approximately as follows : —

	Sq. Miles.
North Metropolitan district, ...	85
South Metropolitan district, ...	102
Total, ...	187

The development of this area from the original district of 114 square miles, created by chapter 439 of the Acts of 1889, is set forth in detail in the eleventh annual report, pages 3, 4 and 5, and is briefly summarized in the following table : —

Table showing the Development of the Metropolitan Sewerage System, 1889 to 1900, with the Legislative Acts referring thereto.

	Cities and Towns included in Area.	Area provided for (Square Miles).		Number and Date of Act.
North Metropolitan District.	Original North Metropolitan district, including Arlington, Belmont, Boston (portions of), Cambridge, Chelsea, Everett, Malden, Medford, Melrose, Somerville, Stoneham, Winchester, Winthrop and Woburn.	71.88		Chapter 439, Acts of 1889.
	Wakefield (Greenwood and Boyntonville).	.95		Chapter 414, Acts of 1896.
	Lexington (part of), ...	5.11		Chapter 520, Acts of 1897.
	Wakefield (central village, etc.), . .	6.70		Chapter 172, Acts of 1900.
	Total area of North Metropolitan district, ...		84.64	
South Metropolitan District.	Original Charles River district, including Boston (portions of), Brookline, Newton, Waltham and Watertown.	42.00		Chapter 439, Acts of 1889.
	Neponset valley district, including Boston (portions of), Dedham (part of), Hyde Park and Milton.	39.57*		Chapter 406, Acts of 1895.
	High-level sewer: Boston (portions of) and Quincy.	20.98		Chapter 424, Acts of 1899.
	Total area of South Metropolitan district, ...		102.55	
	Total area of metropolitan sewerage district, Sept. 29, 1900, . . .		187.19	

* After deducting 4.70 square miles for town of Westwood.

The whole of the present area of 187 square miles is shown on the general map accompanying this report. The present distribution of area and populations, by cities and towns, is shown in the following table. The returns of the national decennial census of 1900 have not been fully published at this date, but such advance information as is available justifies the opinion that the conditions indicated in the table will not be materially affected by the definite returns.

Table showing the Areas and Estimated Populations within the Metropolitan Sewerage District, Sept. 29, 1900.

	CITY OR TOWN.	Area (Square Miles).		Estimated Population, Sept. 29, 1900.	
North Metropolitan District.	Arlington,	5.20		8,100	
	Belmont,	4.66		4,000	
	Boston (portions of),	3.45		93,500	
	Cambridge,	6.11		93,700	
	Chelsea,	2.24		34,400	
	Everett,	3.34		26,000	
	Lexington,*	5.11		2,900	
	Malden,	5.07		37,700	
	Medford,	8.35		19,100	
	Melrose,	3.73		15,600	
	Somerville,	3.96		64,200	
	Stoneham,	5.50		6,900	
	Wakefield,	7.65		9,800	
	Winchester,	5.95		7,400	
	Winthrop,	1.61		5,900	
	Woburn,	12.71		15,900	
			84.64		445,000
South Metropolitan District.	Boston (portions of),	20.92		111,200	
	Brookline,	6.81		20,200	
	Dedham,*	9.40		8,000	
	Hyde Park,	4.57		14,100	
	Milton,	12.59		6,900	
	Newton,	18.03		33,700	
	Quincy,	12.56		25,900	
	Waltham,	13.63		23,600	
	Watertown,	4.04		9,300	
			102.55		252,900
	Totals,		187.19		697,900

* Part of town.

Within the entire metropolitan district there is now in existence a total length of 71.9 miles of metropolitan sewers, as shown on the general map. Of this total, 8.8 miles have been purchased from cities and towns of the district, as shown in the following table: —

Table of Sewers purchased to Sept. 29, 1900.

Date of Purchase.	From whom purchased.	Size.	Length (Miles).	Cost.	Legislative Acts authorizing Purchase.
Sept. 10, 1892,	City of Boston,	6′ 6″ diameter, .332 4′ 8″ twin sewer, .015 5′ 6″ diameter, .008 .355		$59,076 00	Chapter 439, Acts of 1889, Huntington Avenue sewer.
Oct. 3, 1893,	City of Boston,	26″ × 28″, 2.240 15″, .547 2.787		52,637 00	Chapter 439, Acts of 1889, Mystic valley sewer.
Jan. 22, 1898,	City of Boston,	36″ × 48″, .981 28″ × 42″, .260 1.241		100,000 00	Chapter 406, Acts of 1895, Neponset valley sewer.
Nov. 21, 1896,	Town of Melrose,	24″, .154 20″, .005 18″, .512 15″, .065 .736		15,000 00	Chapter 414, Acts of 1896, South Wakefield extension.
Dec. 31, 1898,	Town of Arlington,	18″, .999 15″, .115 12″, 1.517 2.631		42,400 13	Chapter 520, Acts of 1897, Lexington extension.
Oct. 8, 1898,	City of Malden,	36″, .601 30″, .181 18″, .206 .988		50,096 51	Chapter 215, Acts of 1898, Everett outlet sewers.
Aug. 6, 1900,	Town of Watertown,	24″, .002 12″, .049 .051		10,912 00	Chapter 464, Acts of 1900, Watertown siphon.
Total,			8.789	$330,121 64	

The remaining 63 miles of metropolitan sewer have been constructed by your Board. The position, lengths and sizes of these sewers are shown in the following tables, together with a list of the public and special connections made with the system in each city and town: —

NORTH METROPOLITAN AREA.

Table showing Locations, Lengths and Sizes of Metropolitan Sewers within the North Metropolitan Area, and the Number of Public and Special Connections made with the System in Each City and Town.

CITY OR TOWN.	Size of Sewers.	Length in Miles.	Public Connections, Sept. 29, 1900.	Special Connections.	
				Character or Location of Connection.	Number in Operation.
Boston: —					
Deer Island,	6′ 3″ to 9′,	1.367	2	- -	-
East Boston,	9′ to 1′,	5.467	16	- -	-
Charlestown,	6′ 7″×7′ 5″ to 1′,	3.292	11	Navy Yard,	4
Winthrop,	9′,	2.864	5	Club house,	1
Chelsea,	8′ 4″×9′ 2″ to 2′ 1″×2′ 10″,	2.212	4	Bakery, / Rendering works, / Metropolitan Water Board, blow-off.	3
Everett,	8′ 2″×8′ 10″ to 4′ 6″×5′ 1″,	2.925	3	Metropolitan Water Board, blow-off.	1
Malden,	3′ 9″×4′ 1″ to 1′ 3″,	3.140*	22	Metropolitan Water Board, blow-off. / Private houses,	1 / 91
Melrose,	1′ 10″×2′ 9″ to 10″,	3.843†	27	Private houses,	85
Cambridge,	5′ 2″×5′ 9″ to 1′ 3″,	5.963	19	Slaughter-house,	1
Somerville,	6′ 5″×7′ 2″ to 1′ 10″×2′ 3″,	3.471	8	Slaughter-houses (3),	1
Medford,	4′ 8″×5′ 1″ to 10″,	5.359	17	Private houses,	6
Winchester,	2′ 11″×3′ 3″ to 1′ 3″,	6.403	8	Tannery, / Private house,	2 / 1
Stoneham,	1′ 3″ to 10″,	.010	2	- -	-
Woburn,	1′ 10″×2′ 4″ to 1′ 3″,	.933	3	Glue factory,	1
Arlington,	1′ 6″ to 10″,	3.520‡	28	Private houses,	52
Belmont,§	- -	-	1	- -	-
Wakefield,§	- -	-	-	- -	-
		50.769‖	176		250

* Includes .988 of a mile of sewer purchased from the city of Malden.

† Includes .736 of a mile of sewer purchased from the town of Melrose.

‡ Includes 2.631 miles of sewer purchased from the town of Arlington.

§ The metropolitan sewer extends but a few feet into the towns of Belmont and Wakefield.

‖ Includes 2.787 miles of Mystic valley sewer in Medford, Winchester and Woburn running parallel with the metropolitan sewer.

SOUTH METROPOLITAN AREA.

Table showing Locations, Length and Sizes of Metropolitan Sewers within the South Metropolitan Area, and the Number of Public and Special Connections made with the System in Each City and Town.

CITY OR TOWN.	Size of Sewers.	Length in Miles.	Public Connections, Sept. 29, 1900.	Special Connections.	
				Character or Location of Connection.	Number in Operation.
Part of Boston (proper).	6′ 6″ to 5′ 6″, . . .	1.500*	8	Private houses, .	1
				Administration building, Boston park department, . .	1
Boston (Brighton).	5′ 6″ to 12″, . . .	3.714†	10	Abattoir, . . .	3
Boston (Dorchester).	3′×4′ to 2′ 6″×2′ 7″, .	2.870‡	6	- -	-
Boston (Roxbury).	6′ 6″×7′, ...	.055	-	- -	-
Boston (West Roxbury).	9′ 3″×10′ 2″ to 12″, . .	4.094	3	Parental School, .	1
Brookline, .	5′ 6″, ...	.127	1	- -	-
Dedham, . .	4′×4′ 1″ to 3′ 9″×3′ 10″,	2.350	-	- -	-
Hyde Park, .	10′ 7″×11′ 7″ to 4′×4′ 1″,	3.585	10	- -	-
Milton, . .	1′ 8″ to 8″, . . .	.050	3	- -	-
Newton, . .	4′ 2″×4′ 9″ to 3′ 6″×4′, .	2.057	6	Private houses, . .	2
Quincy, . .	- -	-	-	- -	-
Waltham, .	3′ 6″×4′, ...	.001	1	- -	-
Watertown, .	4′ 2″×4′ 9″ to 12″, . .	.750§	5	Factory, . . .	1
		21.153	53		9

* Includes .355 of a mile of sewer purchased from the city of Boston.
† Includes .026 of a mile of sewer purchased from the town of Watertown.
‡ Includes 1.24 miles of sewer purchased from the city of Boston.
§ Includes .025 of a mile of sewer purchased from the town of Watertown.

The cost of the 71.9 miles of metropolitan sewers enumerated above, including pumping stations, siphons and appertaining structures, is given in detail in the report of your Board (pages 5 and 6), and may be summarized as follows: —

50.7 miles North Metropolitan system, . .	$5,317,274 37
21.2 miles South Metropolitan system, . .	2,045,639 69
	$7,362,914 06

The last annual report indicates that on Sept. 30, 1899, there were 70.2 miles of metropolitan sewers. There has consequently been added, during the year, a length of 1.7 miles. This includes about 270 lineal feet of local sewer, known as the Watertown siphon, purchased on Aug. 6, 1900, from the town of Watertown,

under the authority of chapter 464 of the Acts of that year. This siphon, crossing the Charles River at the easterly end of Watertown, was constructed by your Board in 1896–97, at the cost of the town, as fully described in the ninth annual report, pages 15 and 16.

The remaining length added during the year consists of new high-level sewers in the South Metropolitan district, authorized by chapter 424 of the Acts of 1899, and referred to in detail later in this report.

The following table gives details of areas, populations and other data for the whole metropolitan system : —

Table giving Details of Areas, Estimated Resident Population within Area, Estimated Populations contributing Sewage, Miles of Local Sewers connected with Metropolitan Sewers, and Number of Connections.

North Metropolitan System.

Area (Square Miles).	Estimated Total Population.	Miles of Local Sewer connected.	Estimated Population contributing Sewage.	Ratio of Contributing Population to Total Population.	Connections made with Metropolitan Sewers.	
					Public.	Special.
84.64	445,000	459.97	303,449	68.2	176	250

South Metropolitan System.

102.55	252,900	307.54	103,285	40.8	53	9

Summary. — Entire Metropolitan District, inclusive of High-level District added in 1899.

187.19	697,900	767.51	406,734	58.3	229	259

Contrasting these figures with the corresponding data in the last annual report, it appears that the population of the entire metropolitan district has increased by 119,724 persons during the year. Of this increase, 99,116 represent the additions to the metropolitan area, in Wakefield, in the North Metropolitan district, and the added high-level area, including Quincy and portions of Boston, in the South Metropolitan district. The remaining 20,608 persons are estimated as the natural growth of population in the district included in last year's statistics. Of the estimated gross population of 697,900 on Sept. 29, 1900, about 406,734, representing 58.3 per cent., were on that date contributing sewage to the metropolitan sewers through a total length of about 767 miles of local sewers owned by the individual municipalities.

These sewers are connected with the metropolitan system by 229 public and 259 special connections.

Further comparison of the figures for the two years indicates that the population contributing sewage has increased within the year by about 12,574, that about 40.9 miles of local sewers have been added to those connected a year ago, and that 7 public and 41 special connections have been made with the system during the year.

The following table shows the average daily volumes of sewage handled at each of the four North Metropolitan pumping stations during the year ending Sept. 29, 1900, as compared with the corresponding volumes for the previous year: —

PUMPING STATION.	Average Daily Pumpage.			
	Year ending Sept. 30, 1899.	Year ending Sept. 29, 1900.	Decrease.	Decrease.
	Gallons.	Gallons.	Gallons.	Per Cent.
Deer Island, ...	47,600,000	44,600,000	3,000,000	6.30
East Boston, ...	46,200,000	42,400,000	3,800,000	8.22
Charlestown, ...	28,000,000	27,500,000	500,000	1.79
Alewife Brook, ...	3,501,000	3,543,000	42,000*	1.20*

* Increase.

The total rainfall during the year was considerably below the average of a series of years, and mainly on this account a smaller volume of sewage has been pumped than in the preceding year. The decrease in the average daily pumpage for all stations is 5.79 per cent. for the year. The decrease in the total volume of sewage discharged at the Deer Island outfall is 6.30 per cent.

The additions to existing pumping plants at all four stations of the North Metropolitan system, for which the sum of $142,500 was appropriated by chapter 424 of the Acts of 1898, have been fully completed during the year. A detailed record of the tests applied to these plants, and other information relating thereto, are given later in this report.

Extensions of the North Metropolitan system in Chelsea and Everett and through Malden and Melrose to Wakefield were respectively authorized by chapters 184 and 172 of the Acts of 1900. Detailed studies have been prepared for these extensions. Contracts for the two Chelsea and Everett sections have been awarded, and construction has been commenced during the present month. The Wakefield sections are in readiness for contracts during the coming month.

Surveys and engineering studies in connection with the high-level sewer, authorized by chapter 424 of the Acts of 1899, have been continued during the year. The final location for so much of the system as lies north of the Neponset River has been determined, contracts for nine sections have been let, and the work is now in progress.

DETAILED STATEMENT RELATING TO CONSTRUCTION ON THE NORTH METROPOLITAN SYSTEM DURING THE YEAR ENDING SEPT. 29, 1900.

Additions to Existing Pumping Plants.

The foundations and connections for these plants were constructed by day labor, under the direct supervision of the engineering department. This work was begun and largely completed during the previous year, and was fully described in the last annual report. It was completed early in the present year. The amounts expended by day labor for foundations and connections, including all charges for supervision, etc., are as follows: —

Deer Island,	$17,101 69
East Boston,	16,815 99
Charlestown,	16,094 59
Alewife Brook,	1,723 50
	$51,735 77

Contracts for the engines, pumps and boilers required by these additions to existing plants were awarded as shown by the following table, which also gives the expenditures to date and the amounts remaining payable under the contracts: —

NAME OF CONTRACTOR	Station.	Date of Contract.	Amount of Contract.	Amounts paid on Contracts to Sept. 29, 1900.	Balances due on Contracts.
Edward P. Allis Company of Milwaukee, Wis.,	Deer Island,	Oct. 1, 1898,	$27,200 00	$24,480 00	$2,720 00
Edward P. Allis Company of Milwaukee, Wis.,	East Boston,	Oct. 1, 1898,	25,600 00	23,040 00	2,560 00
Edward P. Allis Company of Milwaukee, Wis.,	Charlestown,	Oct. 1, 1898,	25,800 00	23,220 00	2,580 00
The George F. Blake Manufacturing Company, Boston,	Alewife Brook,	Sept. 17, 1898,	7,500 00	5,625 00	1,875 00
Totals,			$86,100 00	$76,365 00	$9,735 00

It appears from the foregoing figures that the total expenditures on the additions to existing plants, including the balances due, will amount to $137,835.77, leaving an unexpended balance of $4,664.23 out of the $142,500 appropriated for this purpose.

The additions to existing pumping plants at the three main line stations have been in satisfactory operation since the following dates: —

Charlestown,	Jan. 15, 1900.
East Boston,	April 5, 1900.
Deer Island,	May 1, 1900.

The various tests specified in the contracts have been made, as appears in the following record of capacity and coal-duty tests. The contract requirements were as follows: —

Capacity Tests. — Contract Requirements.

STATION.	Duration of Test (Hours).	Lift in Feet.	Quantity (Cubic Feet per Second).	Gallons per Twenty-four Hours.
Deer Island,	12	19	70	45,200,000
East Boston,	12	19	70	45,200,000
Charlestown,	12	8	93	60,100,000
Alewife Brook,	12	13	20	12,930,000

Coal-duty Trials. — Contract Requirements.

STATION.	Duration of Trial (Hours).	Lift in Feet.	Quantity (Cubic Feet per Second).	Gallons per Twenty-four Hours.	Duty guaranteed.
Deer Island,	24	11	70	45,200,000	80,000,000
East Boston,	24	15	70	45,200,000	80,000,000
Charlestown,	24	8	93	60,100,000	75,000,000
Alewife Brook,	24	13	20	12,930,000	50,000,000

As the engines and pumps at the three main line stations were to be identical, and in order to avoid interruption of the continuous service at the remaining two stations, it was provided by the contract that the coal-duty trials should be made upon one engine only, to be selected by the engineer. Under this provision the East Boston station was chosen as the most convenient. Beginning with the month of May, capacity tests were run at all stations, with the following results: —

Results of Capacity Tests.

STATION.	Date.	Duration of Test (Hours).	Average Lift (Feet).	Quantity (Cubic Feet per Second).	Gallons per Twenty-four Hours.	Ratio of Work to Contract Requirements.
East Boston and Deer Island,	May 22, 1900,	12	19.04	82.2	53,100,000	1.177
Charlestown, ...	July 26, 1900,	13	12.68	92.4	59,700,000	1.574
Alewife Brook, . . .	May 3, 1900,	24	13.05	20.2	13,032,000	1.012

In these capacity tests the precise relative values of lift and quantity specified in the contracts were not attained, as the operations were necessarily controlled by the conditions of sewage flow prevailing during the included period. It will be seen, however, that an excess over the aggregate of work required under the contracts was developed in each case.

In the coal-duty trials at East Boston for the main line stations, it was found desirable, in the contracts for these additions to existing plants, to modify the method of measuring the volume of sewage lifted, as compared with the method adopted in 1896 in the tests of the original pumping plants at these stations. This was due to the difficulty of inserting a weir in the discharge channels under the present system of operation. The volumes were, therefore, determined from depths of flow in the sewer, which had been carefully rated by current meter observations and comparative records since the date of the earlier tests.

Results of Coal-duty Trials.

	Deer Island and East Boston.	Charlestown.
Date of test, ...	July 10-11, 1900.	July 26-27, 1900.
Time of starting, ...	10 A.M., July 10.	9 A.M., July 26.
Time of ending, ...	10 A.M., July 11.	9 A.M., July 27.
Duration of test (hours), ...	24	24
Average speed of engine (revolutions per minute), .	81.2	74.0
Average elevation of suction sewer, ...	90.61	94.77
Average elevation of discharge sewer, . . .	107.18	107.38
Average lift (feet), ...	16.57	12.61
Average rate of discharge (gallons per twenty-four hours), ...	40,700,000	49,600,000
Weight of water per gallon (pounds), ...	8.355	8.355
Average water horse-power, ...	119.0	110.4
Average steam pressure, ...	116.7	113.7
Average pressure, first receiver, ...	21.5	19.2
Average pressure, second receiver, ...	—3.8	—4.8
Average pressure, vacuum (pounds), ...	13.75	13.7
Total coal burned (pounds), ...	6,799	6,625
Percentage of moisture in coal, ...	2.8	1.7
Total dry coal burned (pounds), ...	6,609	6,512
Dry coal burned per hour (pounds), ...	275.4	271.3
Total water fed to boiler (pounds), ...	71,200	*67,715
Feed-water per hour (pounds), ...	2,967	2,821

* Includes 5,160 pounds steam leakage between boiler and engine.

Results of Coal-duty Trials — Concluded.

	Deer Island and East Boston.	Charlestown.
Temperature of feed-water entering economizer (degrees F.),	104	104
Temperature of feed-water entering boiler (degrees F.),	180	181
Indicated horse-power, high pressure,	67.01	61.18
Indicated horse-power, intermediate pressure,	74.58	63.57
Indicated horse-power, low pressure,	74.11	63.41
Total indicated horse-power,	215.70	188.16
Duty, based on dry coal,	85,260,000	*86,860,000
Apparent evaporation per pound of coal,	10.8	10.4
Equivalent evaporation from and at 212° F.,	11.6	11.2
Efficiency of pump and engine (percentage),	55.2	58.7
Steam consumption per indicated horse-power per hour (pounds),	13.8	13.9

* With coal allowances for leakage.

In these coal-duty trials at the main line stations the duties specified in the contracts have in all cases been exceeded. Owing to the inability to maintain the precise values under the fluctuating conditions of actual work for a period of twenty-four hours, the quantities and lifts have varied somewhat from those specified in the contracts. These variations were in no case to the advantage of the plant. With the necessary corrections for the changed location of the observations, the results show that the duty developed by the new plants was substantially the same as that of the original installations.

The tests were carried out under the immediate direction of F. I. Capen and Theodore Horton, assistant engineers. The contractors were represented by J. H. Lewis of the Edward P. Allis Company. The observers were employees of the Board.

Minor alterations are now in progress on the plant of the George F. Blake Company at the Alewife Brook pumping station. The duty guaranteed by the contractors, under the twenty-four hour coal-duty trial specified in the contract, has not yet been attained.

Sewer Construction.

Section 56, Additional Outlets, Chelsea and Everett.

Location. — From near the junction of Eastern Avenue and Willoughby Street, in Chelsea, extending northerly through Eastern Avenue and Cabot Street to near the westerly line of Clark Avenue.

Assistant Engineer in Charge. — Frank I. Capen.
Contractors. — H. A. Hanscom & Co. of Boston.

Length (Feet).	Size.	Average Cut (Feet).
2,890	42″ and 33″,	18.00

Excavation was commenced on Sept. 25, 1900.

Section 57, Additional Outlets, Chelsea and Everett.

Location. — From near the westerly line of Clark Avenue, in Chelsea, westerly through private land and the metropolitan park reservation to Garfield Avenue; thence through Bell Street and Springvale Avenue to the boundary line between Chelsea and Everett.

Assistant Engineer in Charge. — Frank I. Capen.
Contractors. — H. A. Hanscom & Co. of Boston.

Length (Feet).	Size.	Average Cut (Feet).
5,430	33″, 30″, and 22″ × 28″, ...	10.00

Excavation was commenced on Sept. 27, 1900.

Detailed Statement relating to Construction on the South Metropolitan System during the Year ending Sept. 29, 1900.

This construction consists exclusively of high-level sewer authorized by chapter 424 of the Acts of 1899. The surveys and engineering studies have been extended during the year over the whole length, from the outfall off Nut Island to the proposed connection with the Charles River system in Roxbury; but the actual construction has been confined to that portion, about 6 miles in length, located north of the Neponset River.

The capacity of the main trunk sewer at its outfall is determined by an allowance of 300 gallons per day per capita on the estimated population of the entire South Metropolitan district in 1940, amounting to 986,000, as deduced from a study of census returns and the conditions affecting each locality, and as outlined in the following table: —

Table showing Areas of Cities and Towns Tributary to the High-level Sewer, with their Estimated Populations in the Year 1940.

City or Town.	Area (Square Miles).	Estimated Population in 1940.
Part of Boston (proper), ...	1.61	50,000
Boston (Brighton), ...	4.27	93,000
Boston (part of Dorchester), ...	4.89	76,000
Boston (part of Roxbury), ...	1.23	32,000
Boston (part of West Roxbury), ...	8.92	155,000
Waltham, ...	13.63	89,000
Watertown, ...	4.04	37,000
Newton, ...	18.03	119,000
Brookline, ...	6.81	92,000
Dedham,*	9.40	50,000
Hyde Park, ...	4.57	58,000
Milton, ...	12.59	35,000
Quincy, ...	12.56	100,000
Totals, ...	102.55	986,000

* Part of town.

The same allowance has been applied to the population of the individual districts, with the result that the trunk sewer gradually diminishes in size in its course from the outfall inland. Such returns of the recent national decennial census as are available at this writing lead to the conclusion that the forecast of population for 1940 will show a margin of safety.

The disposal of the sewage of the metropolitan district has recently been reviewed by the State Board of Health, under the authority of chapter 65 of the Resolves of 1899, involving an investigation by that Board of the general question of sewage discharge into Boston harbor. The report shows that the independent investigations of the Board of Health result in a substantial agreement with the estimates of population and allowances for sewage volume adopted as a basis for the high-level sewer project. The State Board of Health suggests that certain areas in Wellesley, Needham and Weston, lying near to the Charles River, may at some future time be added to the South Metropolitan district, and that the sewage of Braintree, Weymouth and Hingham might in like manner be discharged into the outfall of the high-level sewer. In view of the possible increase in volume, due to the former suggestion, a slight increase has been made in the vertical diameters of the sewers under construction.

The more detailed investigation for the precise location of the outfall pipes in the harbor, off Nut Island, led to the selection of points 2,000 feet farther seaward than in the original report. The plans relating to this extension of the outfalls were approved by the State Board of Health on May 11, 1900. The sewage will be discharged into strong currents at a distance of 1 mile beyond Nut Island and at a depth of 30 feet below low water.

Route of the High-level Sewer through Roxbury, West Roxbury and Hyde Park.

The route of the high-level sewer north of the Neponset River, as finally adopted, varies somewhat from that suggested in the preliminary report on the high-level sewer project.

The sewage of the Charles River valley system will be intercepted at the corner of Ruggles Street and Huntington Avenue, and be conveyed by a new sewer, of horseshoe section, 6′ 6″ × 7′ in diameter, with a gradient of 1 in 2,500, in Phillips Street, to the site of a proposed pumping station at the corner of Phillips and Ward streets, Roxbury, where its invert will be about 5 feet below mean low water. The sewage will here be lifted and delivered through two lines of 48-inch force mains, each about 1,500 feet in length and following different routes, and discharging into

a branch of the high-level gravity sewer, with an invert elevation of about 34 feet above mean low water, on St. Alphonsus Street, about midway between Smith and Tremont streets. This sewer will be of horseshoe section, 6′ 6″ × 7′ in diameter, laid at a gradient of 1 in 2,500. It will pass, in tunnel, under St. Alphonsus Street to Calumet Street, thence through public streets and private lands, under Parker Hill, to Heath and Day streets, at Grotto Glen, where the tunnel will be interrupted by about 200 feet of open cut. At this point provision will be made by an 18-inch inlet on the easterly side for the drainage of 73 acres of Roxbury and West Roxbury, adjacent to Centre and Day streets, between Boylston and Heath streets. The 6′ 6″ × 7′ sewer continues in tunnel and without change of gradient to the junction of Day and Perkins streets, where it will join the main line of the high-level sewer, 8′ 3″ × 9′ 2″ in diameter, in a special bell-mouth structure, at a depth of 63 feet below the surface and about 31 feet above mean low water. The main line above this point, intended for the future relief of the Charles River valley system by the diversion of the high-level sewage, is not within the present scheme of construction.

The 8′ 3″ × 9′ 2″ horseshoe sewer will pass under Centre Street, in tunnel, with a gradient of 1 in 3,500, to near Boylston Street, where a change to 9 feet diameter will be effected. This size will be continued under Centre and South streets to the end of the tunnel near St. Joseph Street, where the horseshoe section, increased to 8′ 9″ × 9′ 8″ in diameter, will be resumed. Near St. John Street, in the 9-foot sewer, a junction will be left on the easterly side for a 2′ 6″ × 3′ 9″ branch sewer, to drain 120 acres of West Roxbury, adjacent to Centre Street, between Seaverns and Boylston streets, together with 597 acres of West Roxbury and Roxbury lying east of Stony Brook and bounded generally by Washington, Marcella, Roxbury and Warren streets, Elm Hill Avenue and Seaver Street, — in all about 717 acres, or 1.12 miles. The 8′ 9″ × 9′ 8″ sewer continues, in trench, from St. Joseph Street through South Street to the Arborway, near Forest Hills station, where tunnel will be resumed, continuing to a point in South Street near the Bussey Institution. From this point the sewer will continue through private lands near the Bussey Park Branch Brook, partly in embankment, and with a short length in tunnel, to near the South Street entrance to Bussey woods. Near Keyes Street a 24-inch branch will be provided on the easterly side of the 8′ 9″ × 9′ 8″ sewer, to drain 57 acres of Brookline just west of the West Roxbury line, and 457 acres of West Roxbury between the Brookline boundary line and South and Centre streets,

— a total area of 514 acres, or .8 square miles. A 12-inch branch on the easterly side, near Spaulding Street, will provide for 12 acres of West Roxbury lying between South Street and the Arborway.

Continuing, the sewer will pass through South Street, under the Bussey arch supporting the Dedham branch of the New York, New Haven & Hartford Railroad, and through private lands in embankment along Stony Brook. It will cross Washington Street and continue in private land adjacent to Stony Brook to and across the location of the New York, New Haven & Hartford Railroad, and follow thence the line of Larch Place, near Mount Hope station, Hyde Park Avenue, Hadwin Way, Hammatt Road and Ashland Street to Canterbury Street, where its size will be increased to 9′ 3″ × 10′ 2″. An 18-inch branch on the west, just south of the entrance to Bussey woods, will receive the drainage of 257 acres of West Roxbury, included between the Brookline line and the Arnold Arboretum, and 340 acres of Brookline, in the vicinity of Walnut Hills Cemetery, naturally draining to this point, making a total area of 597 acres, or .93 square miles. Provision will be made for intercepting the existing 36″ × 48″ sewer in Washington Street. A 28″ × 42″ inlet on the west side of the 8′ 9″ × 9′ 3″ sewer, in Harrison Street, will drain 1,200 acres of West Roxbury lying west and south-west of this point, including Roslindale and the area lying west of the West Roxbury parkway and bordering on Lagrange Street and Garfield Avenue. A 12-inch branch on the easterly side, at the intersection of Mount Hope Street and Hyde Park Avenue, will serve an area of 43 acres, or .07 square miles, lying between Hyde Park Avenue and Stony Brook.

At Canterbury Street, on the 9′ 3″ × 10′ 2″ sewer, a 3-foot branch on the easterly side will receive the drainage of 384 acres of West Roxbury, lying between Canterbury and Back streets, 61 acres of Dorchester east of Back Street, and a low-level Dorchester area of 441 acres, from which the sewage is now lifted into the Boston main drainage system at a small pumping station on Lauriat Avenue. The total area provided for by this inlet will thus be 886 acres, or 1.38 square miles. On the westerly side, at the same point, a 12-inch branch will drain about 158 acres, or .25 square miles, of West Roxbury, lying near the Hyde Park line and adjacent to Canterbury and Ashland streets.

From Canterbury Street, in West Roxbury, the 9′ 3″ × 10′ 2″ sewer will extend across the Hyde Park boundary line and along

High Level Sewer, River St., Hyde Park, near Junction with Neponset Valley Sewer.

Stony Brook to a point where it will be carried under the brook by 60-inch cast-iron pipes in duplicate.

The Clarendon Hills district will be drained by a 24-inch branch just above the Stony Brook crossing, in Hyde Park. This district includes about 410 acres of Hyde Park, situated near Bradlee Street and Hyde Park Avenue, and about 233 acres of West Roxbury, draining naturally to this locality, — a total of 643 acres, or 1 square mile.

Shortly after crossing Stony Brook, at an elevation of about 25 feet above mean low water, a tunnel through the divide between Stony Brook and the Neponset River will commence. It will pass under private land, Wood Avenue, Ruskin Road, private land and the location of the New England Railroad to a point in Baldwin Street, Hyde Park, about 300 feet west of East River Street. At East River Street the sewer will be increased to 10′ 7″ × 11′ 7″ in diameter, and 4′ 6″ × 4′ 8″ branches will be built. That on the easterly side will receive the drainage of 1,860 acres of the higher portions of Dorchester lying north of River Street, west of Dorchester Avenue, south of Quincy Street, east of Back Street, and north-east of the Hyde Park-Dorchester line, together with 55 acres of West Roxbury near the junction of Blue Hill Avenue and Warren Street, — a total of 1,915 acres, or about 3 square miles. The branch on the westerly side will receive the entire flow of the Neponset valley intercepting sewer down to this point, *i.e.*, from areas in Hyde Park, Dedham and West Roxbury, comprising about 17.35 square miles, made up as follows: —

	Sq. Miles.
Hyde Park (less Clarendon Hills area),	3.93
Dedham,	9.40
West Roxbury,	4.02
	17.35

The 10′ 7″ × 11′ 7″ sewer continues through Monponset Street to near the Neponset River, where its invert will be about 24 feet above mean low water. The sewer will be carried under the Neponset River by three parallel lines of 60-inch cast-iron pipes.

For purposes of construction, the line north of the Neponset River has been divided into 14 contract sections, particulars of which are given in the following table: —

Details of Contract Sections, High-level Sewer, North of Neponset River.

Section.	LOCATION.	Size of Sewer.	Total Length of Section (Feet).	Estimated Length in Trench (Feet).	Estimated Length in Tunnel.		Date of Contract.	Date named for Completion.	Amount of Contract.	Estimated Value of Work completed to Sept. 29, 1900.	Percentage of Work completed to Sept. 29, 1900.	Contractor.
					Earth (Feet).	Rock (Feet).						
65	Hyde Park, — Monponsett, River and Baldwin streets.	10′ 7″×11′ 7″, 9′ 3″×10′ 2″.	900	900	-	-	Oct. 13, 1899,	Oct. 1, 1900,	$38,610 00	$20,470 00	53	Beckwith & Quackenbush, Mohawk, N. Y.
66	Hyde Park, — Baldwin Street, Ruskin Road, private land.	9′ 3″×10′ 2″,	5,300	-	-	5,300	Oct. 13, 1899,	Oct. 1, 1901,	215,600 00	27,720 00	13	Ed. W. & John J. Everson, Providence, R. I.
67	Hyde Park, — private land.	9′ 3″×10′ 2″, 60-inch pipe,	325 Stony B	325 rook Cr	- ossing.	-	-	-	-	-	-	- -
68	Hyde Park and West Roxbury, — private land, Ashland Street, Hadwin Way.	9′ 3″×10′ 2″, 8′ 9″×9′ 8″.	2,738	2,698	40	-	Oct. 13, 1899,	Mch. 1, 1901,	68,843 00	67,550 00	98	Beckwith & Quackenbush, Mohawk, N. Y.
69	West Roxbury, — Hyde Park Avenue.	8′ 9″×9′ 8″,	2,600	2,600	-	-	Oct. 13, 1899,	Mch. 1, 1901,	86,125 00	69,000 00	80	Beckwith & Quackenbush, Mohawk, N. Y.
70	West Roxbury, — Larch Place, private land, South Street.	8′ 9″×9′ 8″,	3,740	3,740	-	-	Apr. 14, 1900,	Dec. 1, 1901,	89,492 00	32,080 00	36	Chas. Linehan, Cambridge, Mass.
71	West Roxbury, — South Street, private land.	8′ 9″×9′ 8″,	2,193	2,003	190	-	Apr. 14, 1900,	Dec. 1, 1901,	70,100 00	37,540 00	53	Chas. F. Taylor & Co., Syracuse, N. Y.
72	West Roxbury, — South Street.	8′ 9″×9′ 8″,	3,010	1,870	1,140	-	Sept. 29, 1900,	July 1, 1901,	103,101 00	-	-	Jones & Meehan, Boston, Mass.
73	West Roxbury, — South and Centre streets.	9′ diameter,	4,775	-	3,375	1,400	-	-	-	-	-	- -

74	West Roxbury and Roxbury, — Centre and Day streets.	8′ 3″×9′ 2″, 6′ 6″×7′ 0″,	2,985	200	–	2,785	Sept. 17, 1900,	Oct. 1, 1902,	129,965 00	600 00	0.4	H. P. Nawn, Boston, Mass.	
75	Roxbury, — private land, St. Alphonsus Street.	6′ 6″×7′ 0″,	3,070	–	–	3,070	Apr. 23, 1900,	Apr. 1, 1902,	79,582 50	6,050 00	8	Shaller & Schniglau Company, Chicago, Ill.	
76	Roxbury, — St. Alphonsus, Ward, Smith, Oregon, Conant and Phillips streets.	48-inch pipe (force mains).	3,080	3,080	–	–	–	–	–	–	–	–	–
77	Roxbury, — Ward Street pumping station and connections.	–	–	–	–	–	–	–	–	–	–	–	–
78	Roxbury, — Phillips Street; pumping station to Charles River sewer.	6′ 6″×7′ 0″,	622	622	–	–	–	–	–	–	–	–	–
	Totals, . . .	. . .	35,338	18,038	4,745	12,555	–	–	$881,418 50	$261,010 00	30	–	–

Details of construction, High-level Sewer North of Neponset River.

The trunk sewer of the high-level system, as constructed north of the Neponset River, is generally of the horseshoe type, shown on plates 1 and 3, in which the horizontal diameter closely approximates nine-tenths of the vertical. The arch is slightly pointed. The usual construction consists of concrete invert and side-walls, lined with two 4-inch rings of brickwork in cement. The inner ring is in all cases built in Portland cement mortar. The brick arch is usually 12 inches thick, built in Rosendale natural cement mortar. In the 6′ 6″ × 7′ branch sewer above the bell-mouth at Perkins Street, where built in rock tunnel, the arch is 8 inches thick. In favorable ground Rosendale cement is used for concrete, for the outer ring of the invert, and for the arch; but Portland cement is substituted, especially for concrete, to meet such conditions as the presence of water in the bottom or sides of the trench, for construction in embankment, etc.

Section 65.

Contractor. — Beckwith & Quackenbush, Mohawk, N. Y.
Assistant Engineer in Charge. — Seth Peterson.

This section, approximately 900 feet in length, extends from the Neponset River, through Monponset and Baldwin streets, in Hyde Park, to near the location of the New England Railroad. The work is in open trench, with an average depth of excavation of 25 feet. The excavation has been handled by framed derricks. North-west of River Street the sewer is 9′ 3″ × 10′ 2″ in diameter, and the excavation is largely in rock. The existing Neponset valley sewer, in River Street, is temporarily passed through the new structure by a 24-inch cast-iron pipe, pending the permanent interception of the flow on the completion of the high-level system.

Between River Street and the Neponset River the sewer is 10′ 7″ × 11′ 7″ in diameter, and the excavation is generally in sand and gravel. A small amount of rock is found in Monponset Street, about 500 feet north-west of the river.

A pump well at River Street has yielded an average volume of 380,000 gallons per day, with a maximum observed flow of 500,000 gallons.

Construction was commenced on March 3, 1900. During the seven months to date, a total length of 572 feet of sewer has been completed, equal to an average rate of progress of 20 feet, with a maximum of 32 feet per week.

High Level Sewer in Ruskin Road, Hyde Park. View in Rock Tunnel.

Section 66.

Contractor. — Ed. W. & John J. Everson, Providence, R. I.
Assistant Engineer in Charge. — Seth Peterson.

This section, about 5,300 feet in length, is wholly in tunnel, extending from a point in Baldwin Street, in Hyde Park, near the location of the New England Railroad, under the tracks of the railroad, in Ruskin Road and private lands to Stony Brook, near Bradlee Street. This tunnel, which is expected to be wholly in rock, pierces the divide between the Stony Brook and Neponset River basins. At the lower end, in Baldwin Street, the sewer invert will be 30 feet below the surface of the street; under the railroad tracks, 35 feet; at the north-westerly end of Ruskin Road, 80 feet; at the summit of the divide, 145 feet; and near Stony Brook, 27 feet. The sewer will be 9′ 3″ × 10′ 2″ in diameter. During the year no masonry has been built, the work being confined to tunnel excavation. Mining has been carried on from a shaft 65 feet deep in Ruskin Road, near the middle of the section.

At the date of this report a length of 1,188 feet of tunnel has been excavated, located about equally south-east and north-west of the shaft. Only a very small volume of water, estimated at 150,000 gallons per day, has been encountered in excavation; this has been lifted from a sump at the bottom of the shaft by means of a small piston pump.

The average volume of excavation per lineal foot of tunnel has been about 5½ cubic yards. The shaft was commenced on Dec. 22, 1899, and completed March 8, 1900, on which date the headings from the shaft were commenced. The average rate of progress in the headings has been 44 feet per week, rising to 80 feet as a maximum.

The contractor has installed at the central shaft two cages for moving his material and workmen, operated by double-drum hoisters. The tunnel is lighted by electricity, furnished by a generating plant set up by the contractor. Four Ingersoll-Sergeant drills are used in each heading, driven by compressed air, under a pressure of 80 pounds per square inch, furnished by an Ingersoll-Sergeant compressor. For operating the electric light, hoisters and air compressors the contractor has installed two 100 horse-power horizontal tubular boilers over the line of the tunnel.

The excavated material is delivered to a stone crusher set up by the contractor near the shaft. The crushed material is transported by a belt-conveyer to a hopper, from which it is distributed by push-carts on temporary tracks to storage on private land near

the tunnel. The shaft and tunnel excavation has been examined by Prof. W. O. Crosby, of the Massachusetts Institute of Technology. An abstract of his report is appended: —

The tunnel, so far as excavated, is wholly in felsite, intersected by trap dikes. The felsite was originally formed as a surface flow of lava, and is somewhat varied in character. For the most part, however, it is a very hard and flinty rock, divided in various directions by numerous joint-planes. Some of these joints have been widened and the fissures filled with molten trap (diabase), forming the dikes. The formation has been subsequently considerably disturbed, and the differential movement or slipping along certain joint-planes has sheared and crushed the felsite. Through the action of percolating waters these zones of comminuted felsite have been more or less completely decomposed to clay seams, consisting in part of a pure white kaolin. These clay seams are quite certainly of pre-glacial origin.

Three dikes have been observed in the 700 feet of heading extending from about 500 feet south-east of the shaft in Ruskin Road to 200 feet north-west of it. These vary from 12 inches to 30 feet in width. Two of them run nearly parallel with the heading, and dip about 80° to the north-east. The third trends across the tunnel and dips steeply to the north-west.

The shear-planes and clay seams are not evenly distributed, but with few exceptions they cross the tunnel approximately at right angles, and almost without any exception dip to the north-west, usually at angles of from 30° to 60°. A shear-plane about 500 feet south-east of the shaft is marked by from 6 to 24 inches of white clay and half-decomposed felsite. Other strongly marked shear-planes, with from 2 to 6 or 12 inches of clay, extend over a length of 860 feet out of the total of over 1,100 feet opened up to the date of this report.

As a rule, the clay seams are not so wet as the master joints unaccompanied by trituration and decomposition of the rock. The decomposition of the diabase is probably no longer in active progress, but belongs, mainly at least, to the past. The formation would probably continue for an indefinite period as it now exists, which is substantially true also of the trap dikes. The diabase is in every instance of the greenstone variety, and but little subject to decomposition.

Section 67.

Stony Brook Crossing.

The work included in this section will provide for the crossing of Stony Brook in Hyde Park near Bradlee Street, by means of two parallel lines of 60-inch cast-iron pipes. These will be placed about 5 feet below the present bed of the brook, and connected with the sewer at the shore ends by stop-plank chambers. The total length of the section is about 325 feet. No contracts for this work have been arranged.

High Level Sewer in Harrison St. Extension, West Roxbury. Section in Filled Embankment.

Section 68.

Contractor. — Beckwith & Quackenbush, Mohawk, N. Y.
Assistant Engineer in Charge. — Henry Cleary.

This section, about 2,740 feet in length, extends from near the boundary line between Hyde Park and West Roxbury, through private lands adjacent to Stony Brook, to the junction of Ashland and Canterbury streets in West Roxbury, thence along Ashland Street, Hammatt Road and Hadwin Way to Hyde Park Avenue; 2,693 lineal feet have been completed to date. Below Canterbury Street the sewer is 9′ 3″ × 10′ 2″, and above that point 8′ 9″ × 9′ 8″ in diameter.

About 40 feet of this section at its upper end, where it enters Hyde Park Avenue, have been constructed in tunnel. From Hyde Park Avenue to the junction of Ashland and Canterbury streets the excavation was handled by means of frame derricks; below Canterbury Street, in private lands along Stony Brook, a bucket excavating machine was used. The average depth of excavation in open trench is about 17 feet. Excavation was begun Nov. 20, 1899, and the average rate of progress to date has amounted to 60 lineal feet of finished sewer per week, with a maximum of 120 feet. The excavation was wholly in sand and gravel. Along Stony Brook large quantities of boulders were found. The maximum volume of ground water pumped at any one pump-well was 240,000 gallons per day. Surplus earth from the trenches has been used to form an embankment over the sewer in private lands along Stony Brook, where there would otherwise have been an insufficient depth of cover. The embankment is 16 feet wide at top, with slopes of $1\frac{1}{2}$ to 1.

Section 69.

Contractor. — Beckwith & Quackenbush, Mohawk, N. Y.
Assistant Engineer in Charge. — Henry Cleary.

This section of 8′ 9″ × 9′ 8″ sewer extends along Hyde Park Avenue from Hadwin Way to Larch Place, in West Roxbury, — a total distance of 2,600 feet, of which 1,990 feet have been completed to date. The work has been wholly in open trench, having an average depth of 26 feet, with a maximum of 37 feet near Mount Hope station. For about 600 feet at the lower end the excavation was in clay, and thence to Mount Hope station in fine sand. Only a small amount of ground water was found in the excavation. The maximum rate of pumping was 220,000 gallons per day. For a length of 300 feet, near Mount Hope station, the fine sand in which the lower part of the trench was excavated

moved under the head of ground water. Five tubular wells were driven through the stratum of fine sand into the underlying gravel 19 feet below. Pumping was continued from these wells for about a month, reducing the head of the ground water sufficiently to enable the masonry to be safely constructed over this length. The average rate of progress has been about 48 lineal feet per week, with a maximum of 96 feet.

Section 70.

Contractor. — Charles Linehan, Cambridge, Mass.
Assistant Engineer in Charge. — A. H. Smith.

This section, about 3,740 feet in length, extends from Hyde Park Avenue, in West Roxbury, through Larch Place, under the main line of the New York, New Haven & Hartford Railroad, through the extension of Harrison Street, along private lands adjoining the railroad and Stony Brook, under Washington Street and in private lands to South Street, at Bussey Arch, and along South Street to Bussey Street. The sewer is 8′ 9″ × 9′ 8″ in diameter, as shown on plates 3 and 4. A total length of 1,230 feet has been completed to date, equal to an average rate of progress of 60 feet per week. The maximum rate of progress per week has been 140 feet.

For about two-thirds of its length, in private lands along Stony Brook, this section of the sewer will be constructed in embankment, with cross-section as shown on Plate 3. The embankment will be 16 feet wide at the top, and have slopes of 1½ to 1. The top of the embankment is generally 6 feet above the level of the ground, and approximately at the level of the existing city streets intersecting this territory. The excavated material from the length of sewer in trench is utilized in the embankment. Passing the Roslindale branch of Stony Brook, a length of about 200 feet of sewer is omitted. The interval will be filled later with 48-inch pipes in duplicate, which will serve until the masonry channel of the Roslindale branch brook is constructed, when the pipes will be replaced by a sewer of the normal section over the brook. A length of 30 feet is omitted at the crossing of Washington Street, where a special structure will intercept the 36″ × 48″ city sewer. The excavation in South and Harrison streets is in clay. No special excavating machinery has been used. The excavation for the section in embankment is sufficiently deep to reach below the superficial stratum of peat, as found in the meadows near the brook, so that a firm foundation on the underlying sand is secured. Only a small amount of water has been found in the excavation. The average volume dealt with by the pumps has not exceeded 200,000 gallons per day.

High Level Sewer in South St., West Roxbury. Passing Bussey Arch.

Section 71.

Contractor. — Charles F. Taylor & Co., Syracuse, N. Y.
Assistant Engineer in Charge. — A. H. Smith.

This section of sewer, 8′ 9″ × 9′ 8″ in diameter, has a total length of about 2,200 feet, extending along South Street from Bussey Street to the entrance to Bussey woods. Leaving South Street at this point, the sewer extends through private land for a length of about 1,000 feet, and re-enters South Street in a tunnel about 200 feet in length at the end of the section. As originally projected, the route of the lower end of this sewer was to have been in tunnel for a short distance through the parkway. At the request of park officials and others, the location was changed to South Street, as above. The length completed to date amounts to 1,100 feet, largely in private lands.

At the date of this report the tunnel excavation in sand and gravel at the end of the section has been completed. For about half of the length through private land the work has been in open cut, the remainder in open cut and embankment. The top of the embankment is finished about 3 feet above the outside of the sewer arch, and extended to join the slope of the hill on the west, as shown on Plate 6.

For a length of about 175 feet near Station 15, beds of peat were found extending below the elevation of the sewer foundations. The peat was excavated and replaced by concrete filling extending down to firm ground. The excavation has been handled by bucket excavators. It is estimated that an average flow of 230,000 gallons of ground water per day has been handled by the pumps.

The average rate of progress has been 56 feet per week, with a maximum of 133 feet.

Section 72.

Contractor. — Jones & Meehan, Boston.
Assistant Engineer in Charge. — A. H. Smith.

This section extends from near the Bussey Institution, along South Street, under the Arborway, and along a further part of South Street to the easterly side of St. Joseph Street, — a total distance of just over 3,000 feet. The lower portion for an estimated length of 1,140 feet will be in tunnel, through sand and gravel, terminating on the easterly side of the Arborway at South Street. The remainder will be in trench, at an average depth of 20 feet. The contract for this section was awarded on Sept. 29, 1900, so that no progress is yet to be reported.

Section 73.

This section will extend along South and Centre streets for a length of about 4,770 feet, commencing at St. Joseph Street and terminating near Boylston Street. It will be wholly in tunnel, driven largely by the use of compressed air and partly with the aid of a metal shield, in view of which a circular cross-section of 9 feet in diameter has been adopted in place of the horseshoe section used elsewhere. Plans and specifications for this contract have been prepared, in anticipation of an early letting.

Section 74.

Contractor. — H. P. Nawn, Boston, Mass.
Assistant Engineer in Charge. — E. Elbert Young.

This section commences in Centre Street, Roxbury, near Boylston Street, and extends through Centre and Day streets to near Heath Street, — a total distance of about 2,980 feet. The whole of this length, with the exception of about 200 feet between Hutchins Avenue and Minden Street, will be in tunnel, probably all in rock, at an average depth of 54 feet below the surface and with a maximum depth of 65 feet. For a length of about 1,000 feet at its lower end the sewer will be 8′ 3″ × 9′ 2″ in diameter. This size will terminate at a bell-mouth junction to be built at Perkins Street, from which point the main line of the high-level sewer is designed to be extended in the future to Newton and other areas. The remaining length included in Section 74 will form the lower end of a branch sewer, 6′ 6″ × 7′ in diameter, intended mainly for the reception of sewage lifted at the proposed pumping station on Ward Street.

The contract was awarded on Sept. 17, 1900. Excavation was commenced on September 26.

Section 75.

Contractor. — Shailer-Schniglau Company, Chicago, Ill.
Assistant Engineer in Charge. — E. Elbert Young.

This is a tunnel section throughout its entire length of 3,070 feet, largely in rock, in which a sewer, 6′ 6″ × 7′ in diameter, passes under Parker Hill, Roxbury, at a maximum depth of 175 feet. Commencing at the junction of Day and Heath streets, the tunnel heading is entered by a side shaft in private land. The sewer passes under private lands and across intersecting streets for a distance of about 1,700 feet. It then enters Calumet Street and

High Level Sewer, South St., West Roxbury. Passing Hemlock Hill.

continues along St. Alphonsus Street to a point about midway between Tremont and Smith streets, where the two 48-inch force mains will enter the sewer in a special bell-mouth structure.

Work was commenced on the Day Street shaft on May 17, 1900. The shaft was excavated to its full depth of 44 feet on June 26, and a length of 288 feet of heading has been completed to date. No masonry has been built.

The contractor handles his men and materials by a single lift, operated by a hoisting engine. The headings are driven by two Rand drills operated by compressed air, under a pressure of 80 pounds per square inch, furnished by a small Rand compressor. The tunnel is lighted by lamps and candles. The average volume of excavation per lineal foot of tunnel is $3\frac{1}{2}$ cubic yards. The average rate of progress per week has amounted to 22 lineal feet of heading, with a maximum of 35 feet. A small piston pump has been found sufficient to handle the volume of water, about 10,000 gallons per day, hitherto encountered. The excavation for the first 200 feet from the shaft is in rock, and the remainder, so far as excavated to date, is in clay. Prof. W. O. Crosby, of the Massachusetts Institute of Technology, has visited the shaft and tunnel, and an abstract of his statement in relation to the materials found is appended: —

The Parker Hill tunnel, extending northward from the shaft at the corner of Heath and Day streets, starts in the conglomerate formation (Roxbury pudding-stone) at a point where the conglomerate is cut by a great dike of greenstone trap (altered diabase). The dike trends north 80° west, and is very nearly vertical. Its north wall divides the shaft diagonally, and cuts the east side of the tunnel at a point about 30 feet from the south end of the tunnel. Its total width cannot be determined until the tunnel has been extended in the opposite direction.

The conglomerate is normal in character, with pebbles rarely exceeding four inches in diameter and mostly one to two inches. It is massive, well jointed and obscurely stratified, the bedding planes dipping north 5 to 10 degrees. The presence of dripping water and especially the inflow of stable drainage, at least 40 feet below the surface, testify to the openness of the joint cracks and the slight thickness of the overlying drift at these points.

The white plastic clay, or kaolin, first appears in the roof at a point about 200 feet from the shaft, and, dipping northward with the conglomerate, finally disappears in the floor of the tunnel, about 75 feet further on. It forms a bed about 15 inches thick, regularly interstratified with the conglomerate and immediately covered by 1 to 2 feet of feldspathic sandstone. The conglomerate above the kaolin is only from 3 to 10 feet thick before the overlying boulder clay or hard-pan (unmodified drift) is reached.

A careful study leads to the conclusion that the bed of kaolin was

originally a bed of shale. Previous to the accumulation of the glacial drift or hard-pan over this surface this shale has been completely decomposed and bleached, probably through the influence of the waters of a swamp or bog, which may be supposed to have covered this ledge in pre-glacial times. The underlying conglomerate is also well rotted to a depth of several feet, becoming gradually more solid downward, and the overlying conglomerate and sandstone are also thoroughly rotted at most points. The fact that this rotten conglomerate and interbedded kaolin survived the powerful abrasive action of the great ice sheet is probably best explained by the rising of the conglomerate ledge to the west and north-west, as is quite clearly shown by the tunnel, so that these products of pre-glacial decomposition, being on the lee side of the ledge (probably rising abruptly on the south), were to some extent protected from the thrust of the ice movement.

From the point where the white clay ends, as already described, the conglomerate continues, overlaid with typical boulder clay or hard-pan, with usually a thin layer of washed material (oxidized sand overlaid by a stiff gray clay), the thickness of which rarely exceeds 12 inches. This washed material, like the decomposed conglomerate and shale, survived the prolonged glaciation without notable disturbance. The top of the conglomerate is at all points several feet higher on the west than on the east side of the tunnel, showing that the surface of the ledge slopes to the east. The boulder clay is of normal character.

The only feature of special interest to be noted is the occurrence in the boulder clay of an occasional shell, corresponding to those which lived in the basin of the Charles River in pre-glacial times, and were scraped up by the ice sheet and incorporated in the drift.

Section 76.

Cast-iron Force Mains.

This section will consist of two lines of 48-inch cast-iron force main, connecting the proposed pumping station on Ward Street with the 6′ 6″ × 7′ sewer on St. Alphonsus Street. The westerly line, about 1,400 feet long, will be laid in Ward Street and St. Alphonsus Street; and the easterly line, following the line of Ward, Phillips, Conant, Oregon, Smith and St. Alphonsus streets, will have a total length of about 1,600 feet in these streets. No contracts have yet been arranged for the manufacture or the laying of these mains.

Section 77.

Ward Street Pumping Station Foundations and Connections.

Studies for the foundations and connections at this station have been made during the year. Architects' plans for the superstructure have been prepared (see frontispiece). The designs involve a main building about 160′ × 77′, with coal pockets and screen

High Level Sewer near South St., West Roxbury. Section in Filled Embankment.

chamber in addition. The chimney shaft will be 150 feet high. Contracts and specifications for the pumping plant to be introduced at this station have been prepared.

Section 78.

Sewer connecting the Existing Charles River System with the Ward Street Pumping Station.

This section will consist of a 6′ 6″ × 7′ sewer, laid at a gradient of 1 in 2,500, in Phillips Street, between the existing Charles River system at Ruggles Street and the proposed pumping station on Ward Street, — a total distance of about 620 feet. The sewer will be constructed in trench at an average depth of 22 feet. The borings indicate that the excavation will be largely through silt and sand. No contracts for this section have been arranged.

Cement Testing.

About 18,000 barrels of cement have been used during the year. This quantity includes about 8,500 barrels of Portland and 9,500 barrels of Rosendale. Only the best brands of American Portland cement have been used. The cement was subjected to the usual careful tests for fineness, tensile strength, specific gravity, checking, cracking, etc.

Office and General Assistants.

The following engineers, with engineering and other assistants, have been employed for the whole or part of the year: —

Assistant Engineers: —

Francis L. Sellew, chief office assistant.
C. Barton Pratt, in charge of surveys and construction of high-level sewer north of the Neponset River.
Frederick D. Smith, in charge of surveys for high-level sewer between Neponset River and the outfall.
Frank I. Capen, in charge of construction, North Metropolitan system, and maintenance studies.
Frank A. Emery, in charge of records.
Theodore Horton, special hydraulic studies and calculations.
John S. Hodgson, special studies.

At the end of the year there were 86 engineering and other assistants employed.

MAINTENANCE.

The following tables show in detail the use made of the completed systems, and include the records of the pumping stations and other maintenance expenses for the year: —

NORTH METROPOLITAN SYSTEM.

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

Cities and Towns.	Miles of Local Sewer connected.	Separate or Combined.	Number of Connections with Local Sewers.	Estimated Number of Persons served by Each House-connection.*	Estimated Population now contributing Sewage.	Estimated Present Total Population.	Estimated Area now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total Population.	Ratio of Contributing Area to Ultimate Area.
							Square Miles.	Square Miles.	Per Cent.	Per Cent.
Boston (Deer Island), .	0.30	Separate, .	-	-	1,300†	1,300	-	-	-	-
Winthrop, . . .	24.63	Separate, .	1,420	4.0	5,680	5,900	1.18	1.61	96.3	73.3
Boston (East Boston), .	19.17	Separate and combined.	4,900	8.5	41,650	49,300	.70	2.18	84.5	32.1
Chelsea, ...	7.96	Combined, .	1,270	6.6	8,382‡	34,400	.38	2.24	24.4	17.0
Everett, ...	17.47	Separate, .	1,423	5.4	7,684	26,000	1.00	3.34	29.6	29.9
Malden, ...	42.88	Separate, .	3,207	5.1	16,356	37,700	2.48	5.07	43.4	48.9
Melrose, ...	32.79	Separate, .	1,881	4.0	7,524	15,600	1.48	3.73	48.2	39.7
Boston (Charlestown), .	20.00	Separate and combined.	5,000	8.0	40,000§	42,900	.64	1.27	93.2	50.4
Cambridge, . . .	110.08	Separate and combined.	13,569	6.7	90,912	93,700	4.91	6.11	97.0	80.4
Somerville, . . .	76.53	Separate and combined.	11,262	5.2	58,561	64,200	3.27	3.96	91.2	82.6
Medford, ...	44.85	Separate, .	2,254	5.3	11,946	19,100	2.38	8.35	62.5	28.5

High Level Sewer near South St., West Roxbury. View in Earth Tunnel.

Winchester, . . .	17.90	Separate, .	522	5.2	2,714	7,400	.93	5.95	36.7	15.6
Woburn, ...	12.13	Separate, .	804‖	5.9	4,744	15,900	.89	12.71	29.8	7.0
Stoneham, . . .	10.38	Separate, .	313	4.3	1,346	6,900	.56	5.50	19.5	10.2
Arlington, . . .	17.30	Separate, .	535	6.0	3,210	8,100	1.60	5.20	39.6	30.8
Belmont, ...	5.60	Separate, .	165¶	6.3	1,440	4,000	.75	4.66	36.0	16.1
Wakefield,** . . .	–	–	–	–	–	9,800	–	7.65	–	–
Lexington,** . . .	–	–	–	–	–	2,800	–	5.11	–	–
Total, . . .	459.97	–	48,525	6.3	303,449	445,000	23.15	84.64	68.2	27.4

* Estimated from assessors' statement of the number of houses in each city or town, and the population from census of 1895 extended to 1900.

† Estimated by Superintendent J. R. Gerrish of the Institution on Deer Island

‡ The Pearl Street district of Chelsea temporarily excluded, owing to connection not being properly maintained.

§ Including 30 persons at navy yard.

‖ Exclusive of Mystic valley sewer and tanneries.

¶ Including 2 connections with McLean Hospital, having an estimated population of 400.

** Wakefield and Lexington not connected.

SOUTH METROPOLITAN SYSTEM.

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

Cities and Towns.	Miles of Local Sewer connected.	Separate or Combined.	Number of Connections with Local Sewers.	Estimated Number of Persons served by Each House-connection.*	Estimated Population now contributing Sewage.	Estimated Present Total Population.	Estimated Area now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total Population.	Ratio of Contributing Area to Ultimate Area.
							Square Miles.	Square Miles.	Per Cent.	Per Cent.
Part of Boston (proper),	20.10	Separate and combined.	1,200	13.1	15,720	16,500	1.12	1.61	95.3	69.6
Boston (Brighton),	49.12	Separate and combined.	2,200	5.7	12,540	19,500	3.09	4.27	64.3	72.4
Brookline,	49.15	Separate and combined.	2,424	6.6	16,000	20,200	2.92	6.81	79.2	42.9
Newton,	88.30	Separate,	4,023	5.5	22,127	33,700	6.05	18.03	65.7	33.6
Watertown,	29.18	Separate,	1,222	5.3	6,477	9,300	1.66	4.04	69.6	41.1
Waltham,	38.12	Separate,	2,445	8.4	20,538	23,600	2.40	13.63	87.0	17.6
Boston (Dorchester),	12.08	Separate and combined.	924	6.3	5,821	29,908	.78	4.89	19.5	16.0
Milton,	3.24	Separate and combined.	62	5.3	329	6,900	.18	12.59	4.8	1.4
Hyde Park,	15.12	Separate,	395	7.5	2,965	14,100	.81	4.57	21.0	17.7
Dedham,	-	-	-	-	-	8,000	-	9.40	-	-
Boston (Roxbury),	-	-	-	-	-	12,592	-	1.23	-	-
Boston (West Roxbury),	3.13	Separate,	120	6.4	768	32,700	.20	8.92	2.3	2.2
Quincy,	-	-	-	-	-	25,900	-	12.56	-	-
Total,	307.54	-	15,015	6.9	103,285	252,900	19.21	102.55	40.8	18.7

* Estimated from assessors' statement of the number of houses in each city or town, and the population from census of 1895 extended to 1900.

WHOLE METROPOLITAN SYSTEM.

Table showing Areas delivering Sewage to the Entire System, inclusive of added High-level Area; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

System.	Miles of Local Sewer connected.	Separate or Combined.	Number of Connections with Local Sewers.	Estimated Number of Persons served by Each House-connection.	Estimated Population now contributing Sewage.	Estimated Present Total Population.	Estimated Area now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total Population.	Ratio of Contributing Area to Ultimate Area.
							Square Miles.	Square Miles.	Per Cent.	Per Cent.
North Metropolitan, .	459.97	Separate and combined.	48,525	6.3	303,449	445,000	23.15	84.64	68.2	27.4
South Metropolitan, .	307.54	Separate and combined.	15,015	6.9	103,285	252,900	19.21	102.55	40.8	18.7
Total, . . .	767.51	-	63,540	6.4	406,734	697,900	42.36	187.19	58.3	22.6

The following tables summarize the pumping-station records for the year: —

Deer Island Pumping Station.

At this station are three submerged centrifugal pumps, with impellers or wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of pumps: 45,000,000 gallons each, with 19-foot lift.
Average duty for the year: 53,500,000 foot-pounds.
Average quantity raised each day: 44,600,000 gallons.
Force employed: 3 engineers, 3 firemen, 6 screenmen and one reliefman.
Coal used: first-quality Cumberland, costing from $2.85 to $3.95 per ton.

Table of Approximate Quantities, Lifts and Duties at the Deer Island Pumping Station of the North Metropolitan System.

Months.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
1899-1900.						
October, .	1,186,200,000	38,300,000	32,900,000	47,400,000	11.32	54,800,000
November, .	1,257,800,000	41,900,000	34,500,000	66,700,000	11.70	52,800,000
December, .	1,108,800,000	35,800,000	30,000,000	45,400,000	11.60	49,800,000
January, .	1,522,300,000	49,100,000	36,200,000	90,100,000	11.40	53,300,000
February, .	1,758,200,000	62,800,000	42,000,000	103,000,000	12.60	59,200,000
March, . .	1,840,300,000	59,400,000	46,300,000	100,000,000	11.74	57,800,000
April, . .	1,296,300,000	43,200,000	35,300,000	61,800,000	11.46	48,800,000
May, . .	1,514,900,000	48,900,000	34,800,000	84,800,000	11.65	56,900,000
June, . .	1,233,000,000	41,100,000	29,800,000	57,000,000	11.39	52,300,000
July, . .	1,174,600,000	37,900,000	32,300,000	49,600,000	11.32	51,800,000
August, . .	1,147,200,000	37,000,000	30,300,000	52,600,000	11.24	53,800,000
September, .	1,207,400,000	40,200,000	34,200,000	78,600,000	11.32	50,200,000
Total, .	16,247,000,000	-	-	-	-	-
Average,	-	44,600,000	34,900,000	69,700,000	11.56	53,500,000

East Boston Pumping Station.

At this station are three submerged centrifugal pumps, with impellers or wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of pumps: 45,000,000 gallons each, with 19-foot lift.
Average duty for the year: 53,000,000 foot-pounds.
Average quantity raised each day: 42,400,000 gallons.
Force employed: 3 engineers, 3 firemen, 5 screenmen and one reliefman.
Coal used: first-quality Cumberland, costing from $2.85 to $3.95 per ton.

Table of Approximate Quantities, Lifts and Duties at the East Boston Pumping Station of the North Metropolitan System.

Months.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
1899-1900.						
October, .	1,080,600,000	34,900,000	30,300,000	47,500,000	14.85	48,700,000
November, .	1,142,600,000	38,300,000	30,400,000	62,100,000	14.93	49,800,000
December, .	1,062,700,000	34,300,000	28,700,000	47,700,000	14.84	48,500,000
January, .	1,495,000,000	48,200,000	33,300,000	86,200,000	15.49	55,200,000
February, .	1,715,200,000	61,300,000	38,200,000	102,400,000	15.59	53,100,000
March, . .	1,777,000,000	57,300,000	37,300,000	98,500,000	15.49	52,800,000
April, . .	1,217,000,000	40,600,000	34,400,000	58,300,000	15.03	53,800,000
May, . .	1,450,200,000	46,800,000	36,800,000	82,800,000	15.30	61,100,000
June, . .	1,135,400,000	37,900,000	27,800,000	55,000,000	15.02	49,700,000
July, . .	1,113,200,000	35,900,000	27,800,000	47,600,000	14.81	53,900,000
August, . .	1,090,200,000	35,200,000	28,300,000	50,600,000	14.83	54,000,000
September, .	1,157,200,000	38,600,000	31,000,000	76,600,000	15.06	55,000,000
Total, .	15,436,300,000	-	-	-	-	-
Average,	-	42,400,000	32,000,000	67,900,000	15.10	53,000,000

Charlestown Pumping Station.

At this station are three submerged centrifugal pumps, two of them having impellers or wheels 7.5 feet in diameter, the other 8.25 feet in diameter. They are driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of pumps: two, 22,000,000 gallons each, with 11-foot lift; one 60,000,000 gallons, with 8-foot lift.
Average duty for the year: 51,200,000 foot-pounds.
Average quantity raised each day: 27,500,000 gallons.
Force employed: 3 engineers, 3 firemen, 4 screenmen and 1 reliefman.
Coal used: first-quality Cumberland, costing $2.85 to $3.95 per ton.

Table of Approximate Quantities, Lifts and Duties at the Charlestown Pumping Station of the North Metropolitan System.

Months.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
1899-1900.						
October, .	803,500,000	23,700,000	20,700,000	33,800,000	8.81	54,000,000
November, .	808,300,000	26,900,000	20,700,000	41,900,000	8.79	56,800,000
December, .	709,100,000	22,900,000	19,900,000	31,500,000	8.74	48,600,000
January, .	875,400,000	28,200,000	21,300,000	38,000,000	8.35	55,100,000
February, .	984,400,000	35,200,000	23,800,000	51,500,000	9.39	68,600,000
March, . .	973,800,000	31,400,000	23,900,000	50,600,000	8.76	49,600,000
April, . .	752,300,000	25,100,000	21,600,000	31,200,000	8.55	41,600,000
May, . .	877,100,000	28,300,000	22,700,000	47,800,000	8.61	46,100,000
June, . .	838,400,000	27,900,000	23,300,000	40,800,000	8.21	50,100,000
July, . .	817,000,000	26,400,000	21,600,000	36,700,000	8.03	47,500,000
August, . .	817,700,000	26,400,000	22,300,000	31,900,000	7.80	45,700,000
September, .	818,900,000	27,300,000	20,700,000	45,300,000	7.93	50,500,000
Total, .	10,075,900,000	-	-	-	-	-
Average,	-	27,500,000	21,900,000	40,100,000	8.50	51,200,000

Alewife Brook Pumping Station.

The plant at this station consists of the original installation of small commercial pumps and engines, *i.e.*, two 9-inch Andrews vertical centrifugal pumps, with direct-connected compound marine engines, together with the recent additions. The latter consist of a specially designed engine of the vertical cross-compound type, having between the cylinders a centrifugal pump rotating on a horizontal axis.

Contract capacity of the two original pumps: 4,500,000 gallons each, with 13-foot lift.
Contract capacity of new pump: 13,000,000 gallons, with 13-foot lift.
Average duty for the year: 16,800,000 foot-pounds.
Average quantity raised each day: 3,543,000 gallons.
Force employed: the normal force of two engineers, working 12-hour shifts each, has been frequently augmented by one man while changes and other work in connection with additional plant were in progress.
Coal used: first-quality Cumberland, costing from $3.50 to $4.45 per ton.

Table of Approximate Quantities, Lifts and Duties at the Alewife Brook Pumping Station of the North Metropolitan System.

Months.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
1899-1900.						
October, .	64,191,000	2,071,000	1,509,000	4,143,000	13.41	12,100,000
November, .	69,165,000	2,305,000	1,473,000	4,143,000	13.46	13,000,000
December, .	60,366,000	1,947,000	1,438,000	2,692,000*	13.41	10,300,000
January, .	101,925,000	3,288,000	1,545,000	7,344,000	13.35	16,800,000
February, .	142,474,000	5,088,000	2,928,000	7,580,000*	13.43	21,200,000
March, . .	193,041,000	6,227,000	3,862,000	7,757,000	13.53	27,400,000
April, . .	121,527,000	4,051,000	2,833,000	5,882,000*	13.61	20,000,000
May, . .	139,793,000	4,509,000	2,978,000	7,108,000*	13.48	19,500,000
June, . .	99,498,000	3,317,000	2,036,000	6,400,000	13.45	16,100,000
July, . .	143,556,000	4,631,000	1,509,000	7,285,000*	13.24	20,100,000
August, . .	76,239,000	2,459,000	1,658,000	4,201,000	13.37	12,300,000
September, .	78,560,000	2,619,000	1,826,000	3,330,000*	13.36	13,200,000
Total, .	1,290,335,000	-	-	-	-	-
Average, .	-	3,543,000	2,133,000	5,655,000	13.42	16,800,000

* Exclusive of day when tide water was pumped for engine-testing purposes.

In the following tables the average cost of pumping during the year at each of the four pumping stations is given in detail, and compared with the corresponding figures in each case for the preceding year: —

Average Cost per Million Foot-gallons for Pumping at the Deer Island Station.

Annual Volume (16,247 Million Gallons) × Lift (11.6 Feet) = 188,465 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.	Cost per Million Foot-gallons in the Previous Year.
Labor,	$8,715 00	$0.04624*	$0.03810
Coal,	4,044 52	.02146	.01986
Oil,	207 09	.00110	.00152
Waste,	31 40	.00017	.00015
Water,	848 80	.00450	.00442
Packing,	182 67	.00097	.00050
Miscellaneous supplies and renewals,	1,868 02	.00991	.00307
Total,	$15,897 50	$0.08435	$0.06762

* Includes labor at screens; deducting this item gives cost of labor $0.03457. Deducting labor at screens gives cost of pumping $0.07268.

Average Cost per Million Foot-gallons for Pumping at the East Boston Station.

Annual Volume (15,436 Million Gallons) × Lift (15.1 Feet) = 233,084 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.	Cost per Million Foot-gallons in the Previous Year.
Labor,	$8,164 96	$0.03503*	$0.02992
Coal,	5,005 59	.02148	.02294
Oil,	189 18	.00081	.00089
Waste,	38 53	.00017	.00016
Water,	810 00	.00347	.00362
Packing,	66 71	.00029	.00012
Miscellaneous supplies and renewals,	1,522 61	.00653	.00208
Total,	$15,797 58	$0.06778	$0.05975

* Includes labor at screens; deducting this item gives cost of labor $0.02602. Deducting labor at screens gives cost of pumping $0.05877.

Average Cost per Million Foot-gallons for Pumping at the Charlestown Station.

Annual Volume (10,076 Million Gallons) × Lift (8.5 feet) = 85,646 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.	Cost per Million Foot-gallons in the Previous Year.
Labor,	$7,311 49	$0.08537*	$0.08302
Coal,	2,089 22	.02439	.02270
Oil,	361 18	.00422	.00393
Waste,	62 61	.00073	.00052
Water,	405 60	.00473	.00373
Packing,	141 13	.00165	.00114
Miscellaneous supplies and renewals,	514 71	.00601	.00312
Total,	$10,885 94	$0.12710	$0.11816

* Includes labor at screens; deducting this item gives cost of labor $0 06669. Deducting labor at screens gives cost of pumping $0.10842.

Average Cost per Million Foot-gallons for Pumping at the Alewife Brook Station.

Annual Volume (1,290 Million Gallons) × Lift (13.4 feet) = 17,286 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot gallons.	Cost per Million Foot-gallons in the Previous Year.
Labor,	$2,570 32	$0.14869	$0.16122
Coal,	1,335 33	.07725	.09493
Oil,	213 15	.01233	.01331
Waste,	15 13	.00088	.00109
Water,	396 60	.02294	.01520
Packing,	16 80	.00097	.00123
Miscellaneous supplies and renewals,	123 21	.00713	.00432
Total,	$4,670 54	$0.27019	$0.29130

Material intercepted at the Screens.

At the three main line stations the sewage is passed through cages set in pairs in the lower sewer and raised or lowered by steam power.

The total amount of material, consisting of paper, rags and other miscellaneous matter, intercepted at the screens during the year ending Sept. 29, 1900, was about 1,200 cubic yards, or about 2 cubic feet per million gallons pumped at Deer Island.

Care of Sewers and Special Structures.

The maintenance of the 72 miles of metropolitan sewers involves the inspection at regular intervals of the regulating valves at the public connections, the flushing and cleaning of the sewers in special cases, the removal of ashes and screenings from the pumping stations, the care of sand-catchers and siphons as required, and the maintenance of the ferry at Shirley Gut.

The total expenditure under this head, during the year, has been as follows: —

North Metropolitan system,	$24,457 28
South Metropolitan system,	5,889 82
Total,	$30,347 10

The metropolitan sewers, pumping stations, etc., are in good condition. With the exception of the solids intercepted by the screens at the pumping stations, it is found that there is a practical absence of deposits requiring removal from the main sewers and siphons. It can be assumed, therefore, that the velocities maintained in the sewers and siphons are sufficient to carry suspended

matters to the outfall. This is confirmed by the observations, periodically made, of losses of head at the siphons, which continue to yield no evidence of appreciable deposit.

Engineering Studies and Supplies.

In addition to the usual detailed studies of the engine records, the necessary trials of additional pumping plants have been made and recorded. Studies for the extension of the metropolitan sewers to Wakefield and elsewhere have been made. The above, with clerical services, office supplies, and maintenance of the office building, No. 1 Mount Vernon Street, have cost for the year $7,738.27.

WILLIAM M. BROWN, Jr.,
Chief Engineer and Superintendent.

APPENDIX.

TABLE A. — MAINTAINING AND OPERATING THE NORTH METROPOLITAN SYSTEM.

1899.				
Oct.	31,	By pay rolls for month, general,	$2,800 23	
	31,	By pay rolls for month, Deer Island,	895 16	
	31,	By pay rolls for month, East Boston,	878 57	
	31,	By pay rolls for month, Charlestown,	842 46	
	31,	By pay rolls for month, Alewife Brook,	308 69	
				$5,725 11
Nov.	30,	By supplies for month, general,	$2,951 07	
	30,	By pay rolls for month, general,	2,067 50	
	30,	By pay rolls for month, Deer Island,	625 73	
	30,	By pay rolls for month, East Boston,	607 77	
	30,	By pay rolls for month, Charlestown,	561 64	
	30,	By pay rolls for month, Alewife Brook,	194 52	
				7,008 23
Dec.	31,	By supplies for month, general,	$1,391 92	
	31,	By pay rolls for month, general,	841 50	
	31,	By pay rolls for month, Deer Island,	317 72	
	31,	By pay rolls for month, East Boston,	299 16	
	31,	By pay rolls for month, Charlestown,	280 82	
	31,	By pay rolls for month, Alewife Brook,	99 72	
				3,230 84
1900.				
Jan.	31,	By supplies for month, general,	$5,416 82	
	31,	By pay rolls for month, general,	3,507 01	
	31,	By pay rolls for month, Deer Island,	1,270 88	
	31,	By pay rolls for month, East Boston,	1,187 84	
	31,	By pay rolls for month, Charlestown,	1,123 28	
	31,	By pay rolls for month, Alewife Brook,	430 68	
	31,	By proportionate expenses, commissioners, clerk, chief engineer and others, for month,	466 67	
				13,403 18
Feb.	28,	By supplies for month, general,	$1,564 99	
	28,	By pay rolls for month, general,	2,258 83	
	28,	By pay rolls for month, Deer Island,	637 91	
	28,	By pay rolls for month, East Boston,	595 57	
	28,	By pay rolls for month, Charlestown,	553 40	
	28,	By pay rolls for month, Alewife Brook,	189 36	
	28,	By proportionate expenses, commissioners, clerk, chief engineer and others, for month,	300 00	
				6,100 06
		Amount carried forward,		$35,467 12

TABLE A. — MAINTAINING AND OPERATING THE NORTH METROPOLITAN SYSTEM — *Continued.*

1900.				
		Amount brought forward, . .	. . .	$35,467 42
March	31,	By supplies for month, general, .	$2,182 66	
	31,	By pay rolls for month, general, .	1,736 14	
	31,	By pay rolls for month, Deer Island,	641 38	
	31,	By pay rolls for month, East Boston,	593 92	
	31,	By pay rolls for month, Charlestown,	556 69	
	31,	By pay rolls for month, Alewife Brook, ...	252 36	
	31,	By proportionate expenses, commissioners, clerk, chief engineer and others, for month, ...	50 00	
				6,013 15
April	30,	By supplies for month, general, .	$5,102 83	
	30,	By pay rolls for month, general, .	1,893 11	
	30,	By pay rolls for month, Deer Island,	666 11	
	30,	By pay rolls for month, East Boston,	598 86	
	30,	By pay rolls for month, Charlestown,	561 64	
	30,	By pay rolls for month, Alewife Brook, ...	174 36	
	30,	By proportionate expenses, commissioners, clerk, chief engineer and others, for month, ...	208 33	
				9,205 24
May	31,	By supplies for month, general, .	$2,071 64	
	31,	By pay rolls for month, general, .	2,210 67	
	31,	By pay rolls for month, Deer Island,	720 77	
	31,	By pay rolls for month, East Boston,	669 13	
	31,	By pay rolls for month, Charlestown,	561 64	
	31,	By pay rolls for month, Alewife Brook, ...	210 36	
				6,444 21
June	30,	By supplies for month, general, .	$3,752 87	
	30,	By pay rolls for month, general, .	3,287 54	
	30,	By pay rolls for month, Deer Island,	1,054 71	
	30,	By pay rolls for month, East Boston,	1,032 12	
	30,	By pay rolls for month, Charlestown,	842 46	
	30,	By pay rolls for month, Alewife Brook, ...	257 04	
	30,	By proportionate expenses, commissioners, clerk, chief engineer and others, for month, ...	75 00	
				10,301 74
July	31,	By supplies for month, general, .	$386 94	
	31,	By pay rolls for month, general, .	848 68	
	31,	By pay rolls for month, Deer Island,	345 42	
	31,	By pay rolls for month, East Boston,	320 04	
		Amounts carried forward, . .	$1,901 08	$67,431 76

TABLE A. — MAINTAINING AND OPERATING THE NORTH METROPOLITAN SYSTEM — *Concluded.*

1900.				
		Amounts brought forward, . .	$1,901 08	$67,431 76
July	31,	By pay rolls for month, Charlestown,	280 82	
	31,	By pay rolls for month, Alewife Brook, ...	85 68	
	31,	By proportionate expenses, commissioners, clerk, chief engineer and others, for month, ...	75 00	
				2,342 58
Aug.	31,	By supplies for month, general, .	$2,202 30	
	31,	By pay rolls for month, general, .	3,172 81	
	31,	By pay rolls for month, Deer Island,	1,028 06	
	31,	By pay rolls for month, East Boston,	966 45	
	31,	By pay rolls for month, Charlestown,	842 46	
	31,	By pay rolls for month, Alewife Brook, ...	284 04	
	31,	By proportionate expenses, commissioners, clerk, chief engineer and others, for month, ...	166 66	
				8,662 78
Sept.	30,	By supplies for month, general, .	$4,809 24	
	30,	By pay rolls for month, general, .	1,622 61	
	30,	By pay rolls for month, Deer Island,	692 49	
	30,	By pay rolls for month, East Boston,	324 97	
	30,	By pay rolls for month, Charlestown,	561 64	
	30,	By pay rolls for month, Alewife Brook, ...	201 36	
	30,	By proportionate expenses, commissioners, clerk, chief engineer and others, for month, ...	258 34	
				8,470 65
				$86,907 77

TABLE B. — MAINTAINING AND OPERATING THE CHARLES RIVER SYSTEM.

1899.			
Oct. 31,	By amount paid for labor and salaries for month, ...	$366 00	
			$366 00
Dec. 31,	By amount paid for supplies for month, ...	$187 38	
	By amount paid for labor and salaries for month, ...	919 00	
			1,106 38
1900.			
Jan. 31,	By amount paid for labor and salaries for month, ...	$75 00	
	By amount paid the city of Boston for receiving and disposing of sewage into the Boston main drainage, ...	43,330 40	
			43,405 40
Feb. 28,	By amount paid for labor and salaries for month, ...	$783 33	
			783 33
March 31	By amount paid for labor and salaries for month, ...	$400 00	
			400 00
June 30,	By amount paid for labor and salaries for month, ...	$780 00	
			780 00
July 31,	By amount paid for labor and salaries for month, ...	$50 00	
			50 00
Aug. 31,	By amount paid for supplies for month, ...	$333 31	
	By amount paid for labor and salaries for month, ...	591 67	
			924 98
Sept. 30,	By amount paid for labor and salaries for month, ...	$75 00	
			75 00
			$47,891 09

TABLE C. — MAINTAINING AND OPERATING THE NEPONSET VALLEY SYSTEM.

1899.			
Oct. 31,	By amount paid for labor and salaries for month, ...	$497 52	$497 52
Nov. 30,	By amount paid for supplies for month, ...	$132 89	132 89
Dec. 31,	By amount paid for supplies for month, ...	$318 15	318 15
1900.			
Jan. 31,	By amount paid the city of Boston for receiving and disposing of sewage into the Boston main drainage, ...	$16,933 38	16,933 38
March 31,	By amount paid for supplies for month, ...	$26 87	
	By amount paid for labor and salaries for month, ...	402 00	428 87
April 30,	By amount paid for labor and salaries for month, ...	$50 00	50 00
May 31,	By amount paid for supplies for month, ...	$38 18	38 18
June 30,	By amount paid for labor and salaries for month, ...	$467 90	467 90
Aug. 31,	By amount paid for supplies for month, ...	$1,583 61	
	By amount paid for labor and salaries for month, ...	952 26	2,535 87
			$21,402 76

TABLE D. — EXPENSES OF BOARD OF METROPOLITAN SEWERAGE COMMISSIONERS FOR THE YEAR ENDING SEPT. 30, 1900.

High-level Sewer.

	1899.			1900.									Totals.
	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	
Section 72,	-	-	-	-	-	-	-	-	-	-	-	$52 87	$52 87
Section 74,	-	-	-	-	-	-	-	-	-	-	-	122 05	122 05
Section 65,	-	$15 90	$21 34	$41 16	$1 00	$18 92	$382 03	$317 28	$4,742 89	$114 69	$4,121 23	4,831 50	14,607 94
Section 66,	-	46 17	12 70	41 16	1 00	240 55	5,072 28	1,788 94	2,060 77	379 45	5,670 04	4,329 13	19,642 19
Section 68,	-	46 55	23 83	1,920 63	2,316 19	1,922 63	2,351 83	6,261 41	15,457 18	257 03	13,434 15	8,008 86	52,000 29
Section 69,	-	35 69	23 83	3,736 49	4,709 86	5,494 46	5,594 35	8,686 67	10,575 87	466 16	9,226 09	7,712 38	56,261 85
Section 70,	-	-	-	-	-	-	236 31	401 43	7,056 87	200 00	6,906 63	7,318 90	22,120 14
Section 71,	-	-	-	-	-	-	205 39	193 47	2,718 98	399 89	8,481 80	9,381 27	21,380 80
Section 75,	-	-	-	-	-	-	96 84	341 61	556 40	442 76	2,791 54	2,522 32	6,751 47
Engineers, inspectors, rodmen, laborers and others	$7,727 10	3,350 59	5,157 94	3,892 14	-	7,919 48	3,350 12	3,079 43	2,922 34	2,725 19	-	9,571 29	49,695 62
Land takings, purchase and recording.	4,590 27	593 95	150 00	61,532 70	-	2,296 40	-	5,750 00	3 15	-	-	2,002 60	76,919 07
Field supplies,	3 38	357 09	95 14	208 74	148 71	104 28	74 64	200 75	95 53	40 27	267 92	114 84	1,711 29
Office supplies,	165 90	170 54	135 13	146 58	97 70	32 21	189 13	44 76	120 80	41 67	159 56	98 32	1,402 30
Engineering supplies,	20 35	366 29	72 42	37 49	115 27	143 12	83 77	19 94	47 47	5 99	3 90	40 83	956 84
Travelling expenses,	82 47	52 50	267 35	279 49	100 80	301 30	190 21	82 87	116 45	38 37	112 90	140 69	1,765 40
Postage, telephone and telegrams.	80	65 97	1 00	54 07	87 10	1 52	109 96	8 05	99 00	73 55	-	27 22	528 24
Commissioners,	750 00	750 00	750 00	750 00	500 00	500 00	-	-	541 67	250 00	1,250 01	583 34	6,625 02

Clerk and chief engineer,	624 99	625 00	625 01	208 33	416 67	625 00	416 67	625 00	625 00	625 00	625 00	416 66	6,458 33
Clerical services,	65 00	65 00	75 00	45 00	–	45 00	120 00	125 00	–	–	–	–	540 00
Teaming and express,	–	18 50	5 56	4 24	8 40	16 80	8 90	3 90	1 90	8 81	–	4 95	81 96
Carriage hire,	–	16 00	14 00	10 00	–	3 00	12 25	12 50	45 00	2 00	31 00	48 00	193 75
Rent of office, Quincy,	–	37 50	18 75	–	18 75	18 75	37 50	20 75	18 75	–	18 75	18 75	208 25
Repairs, fittings and supplies, Building No. 1 Mt. Vernon Street.	–	131 46	162 91	38 91	127 80	–	55 13	1 85	24 73	–	13 74	–	556 53
Photography,	–	17 07	2 00	35	5 39	3 00	–	–	6 00	5 09	–	17 70	56 60
Rent of office, Forest Hills,	–	18 00	–	–	54 00	18 00	36 00	–	36 00	–	36 00	–	198 00
Rent of office, Hyde Park,	–	18 00	–	–	–	–	–	–	–	–	–	–	18 00
Tools and repairs of same,	–	31 94	7 47	4 36	–	5 37	1 05	60	4 65	–	–	1 75	57 19
Maps, plans and blue-prints,	–	–	57 83	2 89	22 72	–	21 12	27 53	4 57	5 53	–	27 09	169 28
Engineering instruments and repair of same.	–	–	6 21	8 35	17 75	7 00	2 60	18 00	7 85	5 95	16 50	1 10	91 31
Experts and appraisers,	–	–	525 00	1,532 50	–	225 00	–	–	–	–	–	–	2,282 50
Rent of office, Hough's Neck,	–	–	–	10 00	–	–	–	–	–	–	–	–	10 00
Legal services,	–	–	–	–	–	476 10	–	–	41 00	–	–	–	517 10
Boat and boat hire,	–	–	–	–	–	–	35 00	–	35 00	–	–	30	70 30
Apportionment commission,	–	–	–	–	–	–	–	–	–	2,000 00	–	–	2,000 00
High-level pumping station,	–	–	–	–	–	–	–	–	–	–	1,250 00	–	1,250 00
Totals,	$14,030 26	$6,829 71	$8,210 42	$74,505 58	$8,749 11	$20,417 89	$18,683 08	$28,011 74	$47,965 82	$8,087 40	$54,416 76	$57,394 71	$347,302 48

TABLE D. — EXPENSES OF BOARD OF METROPOLITAN SEWERAGE COMMISSIONERS FOR THE YEAR ENDING SEPT. 30, 1900 — *Continued.*

North Metropolitan System.

	1899.			1900.									Totals.
	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	
Pumps and alterations, Deer Island.	-	$13,600 00	$100 25	$80 43	$18 09	$40 00	$241 86	$6,997 42	$2 60	-	$4,080 00	-	$25,160 65
Pumps and alterations, East Boston.	$96 00	-	224 58	6,493 44	109 43	171 58	137 93	205 08	-	-	3,840 00	-	11,278 04
Pumps and alterations, Charlestown.	124 50	-	287 15	6,513 70	199 84	27 23	27 25	28 17	-	-	3,873 66	-	11,081 50
Pumps and alterations, Alewife Brook.	46 80	-	-	-	2 35	-	-	-	-	-	-	-	49 15
Land takings, purchase and recording	-	-	-	1,979 69	136 90	-	-	91 40	-	-	-	-	2,207 99
Engineers, inspectors, rodmen, laborers and others	-	-	-	-	78 00	-	-	-	-	-	-	-	78 00
Experts and appraisers, . .	-	-	-	-	35 00	-	-	50 00	-	-	-	-	85 00
Office supplies, ...	-	-	-	-	1 45	-	-	-	1 25	-	-	-	2 70
Postage, telephone and telegrams.	-	-	-	-	-	-	-	30 34	26 61	-	-	-	56 95
Teaming and express, . .	-	-	-	-	-	-	-	40	4 36	-	-	-	4 76
Legal services, ...	-	-	-	-	-	-	-	-	10 00	-	-	-	10 00
Travelling expenses, . .	-	-	-	-	-	-	-	-	5 89	-	-	-	5 89
Section 35, ...	-	-	-	-	-	-	-	-	-	-	-	$284 02	284 02
Totals, ...	$267 30	$13,600 00	$611 98	$15,067 26	$581 06	$238 81	$407 04	$7,402 81	$50 71	-	$11,793 66	$284 02	$50,304 65

Charles River System.

Watertown siphon, . . .	-	-	-	-	-	-	-	-	-	-	$10,912 00	-	$10,912 00

Neponset Valley System.

Land takings, purchase and recording.	-	-	-	-	-	$12,429 01	-	$106 54	-	-	-	-	$12,535 55
Office supplies, ...	-	-	-	-	-	-	-	3 75	-	-	-	-	3 75
Travelling expenses, . .	-	-	-	-	-	-	-	45	-	-	-	-	45
Experts and appraisers, . .	-	-	-	-	-	-	-	620 00	-	-	-	-	620 00
Legal services, ...	-	-	-	-	-	-	-	78 00	-	-	-	-	78 00
Totals, ...	-	-	-	-	-	$12,429 01	-	$808 74	-	-	-	-	$13,237 75

Wakefield Branch Extension.

Engineers, inspectors, rodmen, laborers and others.	-	-	-	-	-	-	-	-	$736 20	-	$686 70	$926 32	$2,349 22
Engineering instruments, .	-	-	-	-	-	-	-	-	22 88	$8 32	-	-	31 20
Field supplies, ...	-	-	-	-	-	-	-	-	24 51	22 33	5 65	-	52 49
Travelling expenses, . .	-	-	-	-	-	-	-	-	66 70	25 50	33 00	-	125 20
Postage, telephone and telegrams.	-	-	-	-	-	-	-	-	30	-	-	-	30
Engineering supplies, . .	-	-	-	-	-	-	-	-	-	12 39	7 50	-	19 89

TABLE D. — EXPENSES OF BOARD OF METROPOLITAN SEWERAGE COMMISSIONERS FOR THE YEAR ENDING SEPT. 30, 1900 — *Concluded.*

Wakefield Branch Extension — Concluded.

	1899.			1900.									Totals.
	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	
Office supplies,	–	–	–	–	–	–	–	–	–	$3 38	$6 15	–	$9 53
Maps, plans and blue-prints,	–	–	–	–	–	–	–	–	–	–	8 40	–	8 40
Commissioners,	–	–	–	–	–	–	–	–	–	–	166 66	–	166 66
Totals,	–	–	–	–	–	–	–	–	$850 59	$71 92	$914 06	$926 32	$2,762 89

Chelsea and Everett Outlets.

Engineers, inspectors, rodmen, laborers and others	–	–	–	–	–	–	–	–	$627 80	–	$585 49	$268 04	$1,481 33
Engineering instruments,	–	–	–	–	–	–	–	–	1 98	–	–	–	1 98
Field supplies,	–	–	–	–	–	–	–	–	23 94	$118 89	–	–	142 83
Travelling expenses,	–	–	–	–	–	–	–	–	7 95	–	–	–	7 95
Engineering supplies,	–	–	–	–	–	–	–	–	–	3 34	6 33	–	9 67
Office supplies,	–	–	–	–	–	–	–	–	–	3 37	6 00	–	9 37
Maps, plans and blue-prints,	–	–	–	–	–	–	–	–	–	–	4 55	–	4 55
Section 56,	–	–	–	–	–	–	–	–	–	–	–	75 74	75 74
Section 57,	–	–	–	–	–	–	–	–	–	–	–	75 73	75 73
Totals,	–	–	–	–	–	–	–	–	$661 67	$125 60	$602 37	$419 51	$1,809 15

TABLE E. — BIDS FOR CONSTRUCTION OF SECTIONS UPON THE HIGH-LEVEL SEWER.

NAME OF BIDDER.	Address.	BIDS OPENED OCT. 7, 1899.			
		Section 65, Hyde Park.	Section 66, Hyde Park.	Section 68, Hyde Park and West Roxbury.	Section 69, West Roxbury.
Long & Little,	Leominster, Mass.,	$76,045 00	-	$115,095 00	-
Jones & Meehan,	Boston, Mass.,	50,645 50	$243,645 00	81,758 75	$90,425 00
Farrell & Hopper,	New York, N. Y.,	47,265 00	398,400 00	80,432 50	88,175 00
C. E. Trumbull & Co.,	Boston, Mass.,	47,140 00	-	91,972 50	-
Manufacturer's Contracting Co,	Newark, N. J.,	46,938 00	-	87,058 75	110,982 50
H. P. Nawn,	Boston, Mass.,	46,000 00	382,650 00	81,350 00	113,900 00
Bruno & Salomone,	East Boston, Mass.,	45,550 00	-	80,484 75	-
National Contracting Co.,	New York, N. Y.,	45,438 50	320,325 00	101,987 50	119,912 50
E. W. & John J. Everson,	Providence, R. I.,	43,750 00	215,600 00*	89,837 50	92,700 00
Frank L. Allen,	Worcester, Mass.,	43,300 00	-	79,775 00	-
Samuel W. Frescoln,	Reading, Pa.,	42,564 40	-	-	-
Metropolitan Contracting Co,	Boston, Mass.,	42,320 00	338,000 00	79,896 50	91,672 00
J. L. Bryne & Co,	Boston, Mass.,	41,945 00	-	-	-
Charles Linehan,	Cambridgeport, Mass,	39,360 00	-	77,207 50	-
Beckwith & Quackenbush,	Mohawk, N. Y.,	38,610 00*	263,460 00	68,843 00*	86,125 00*
Brodhead Contracting Co.,	Easton, Pa.,	-	383,550 00	-	-
R. J. Malone & Co,	Allston, Mass.,	-	359,875 00	-	-
Shaller & Schniglau Co,	Chicago, Ill.,	-	240,150 00	-	-
Richard Falvey,	Somerville, Mass.,	-	-	98,575 00	-
J. L. Bryne & Co.,	Boston, Mass.,	-	-	84,065 00	-
James Driscoll & Son,	Brookline, Mass.,	-	-	80,902 50	-
Daniel E. Lynch,	Boston, Mass.,	-	-	-	-
Geo. R. Newman,	Providence, R. I.,	-	-	-	-
Thos. F. Minton,	Jamaica Plain, Mass.,	-	-	-	-
Thos. J. Young & Co.,	Boston, Mass.,	-	-	-	-
Jehiel Vaughn,	Stamford, N. Y.,	-	-	-	-
H. A. Hanscom & Co.,	Boston, Mass.,	-	-	-	-
Charles F. Taylor & Co.,	Syracuse, N. Y.,	-	-	-	-
John Dunfee & Co,	Syracuse, N. Y.,	-	-	-	-

* Bid accepted.

TABLE E. — BIDS FOR CONSTRUCTION OF SECTIONS UPON THE HIGH-LEVEL SEWER — *Concluded.*

NAME OF BIDDER.	Address.	BIDS OPENED APRIL 7, 1900.			BIDS OPENED SEPT 17, 1900.	BIDS OPENED SEPT. 29, 1900.
		Section 70, West Roxbury.	Section 71, West Roxbury.	Section 75, Roxbury.	Section 74, West Roxbury and Roxbury.	Section 72, West Roxbury.
Long & Little,	Leominster, Mass.,	–	–	–	–	–
Jones & Meehan,	Boston, Mass.,	$110,810 00	$75,115 00	$96,790 00	$139,485 00	$103,101 00*
Farrell & Hopper,	New York, N. Y.,	–	–	–	–	–
C. E. Trumbull & Co.,	Boston, Mass.,	107,818 00	–	–	–	–
Manufacturer's Contracting Co.,	Newark, N. J.,	–	–	–	–	–
H. P. Nawn,	Boston, Mass.,	105,805 00	82,290 00	–	129,965 00*	118,025 00
Bruno & Salomone,	East Boston, Mass.,	98,595 00	93,786 25	–	–	162,306 50
National Contracting Co.,	New York, N. Y.,	125,810 00	88,172 50	127,590 00	–	113,115 00
E. W. & John J. Everson,	Providence, R. I.,	–	–	–	–	–
Frank L. Allen,	Worcester, Mass.,	110,240 00	97,900 00	–	–	–
Samuel W. Frescoln,	Reading, Pa.,	–	–	–	–	–
Metropolitan Contracting Co.,	Boston, Mass.,	131,769 00	–	–	–	–
J. L. Bryne & Co.,	Boston, Mass.,	–	–	–	–	–
Charles Linehan,	Cambridgeport, Mass.,	89,492 00*	71,252 50	–	–	–
Beckwith & Quackenbush,	Mohawk, N. Y.,	106,066 00	87,206 50	119,550 00	–	110,822 50
Brodhead Contracting Co.,	Easton, Pa.,	–	–	–	–	–
R. J. Malone & Co.,	Allston, Mass.,	–	–	–	–	–
Shailer & Schniglau Co.,	Chicago, Ill.,	–	–	79,582 50*	143,445 00	–
Richard Falvey,	Somerville, Mass.,	124,870 00	–	–	–	–
J. L. Bryne & Co.,	Boston, Mass.,	–	–	–	–	–
James Driscoll & Son,	Brookline, Mass.,	121,250 00	–	–	–	–
Daniel E. Lynch,	Boston, Mass.,	148,966 00	–	–	–	–
Geo. R. Newman,	Providence, R. I.,	140,020 00	114,305 00	197,890 00	–	–
Thos. F. Minton,	Jamaica Plain, Mass.,	114,295 00	–	–	–	–
Thos. J. Young & Co.,	Boston, Mass.,	105,147 00	–	–	–	–
Jehiel Vaughn,	Stamford, N. Y.,	100,000 00	–	–	–	–
H. A. Hanscom & Co.,	Boston, Mass.,	96,847 00	–	–	–	–
Charles F. Taylor & Co.,	Syracuse, N. Y.,	96,265 00	70,100 00*	79,315 00	163,100 00	–
John Dunfee & Co.,	Syracuse, N. Y.,	–	–	–	–	134,000 00

* Bid accepted.

TABLE F. — MISCELLANEOUS BIDS UPON THE NORTH METROPOLITAN SYSTEM.

NAME OF BIDDER.	Address.	Coal.			
		DEER ISLAND PUMPING STATION.	EAST BOSTON PUMPING STATION	CHARLESTOWN PUMPING STATION.	ALEWIFE BROOK PUMPING STATION.
		Bids opened June 29, 1900.	Bids opened June 29, 1900.	Bids opened June 29, 1900.	Bids opened June 29, 1900.
Henry T. Woods,	Boston, Mass.,	$4 40*	$4 40*	$4 40*	$4 40*
Wellington-Wild Coal Co.,	Boston, Mass ,	-	-	-	4 72*
Metropolitan Coal Co.,	Boston, Mass.,	3 95*†	3 95*†	3 95*†	4 45*†
Curtis & Pope Lumber Co.,	Boston, Mass.,	-	-	-	-
Harry Stevens, agent,	Melrose, Mass.,	-	-	-	-
Portland Stoneware Co.,	Boston, Mass.,	-	-	-	-
Fisk & Co.,	Boston, Mass.,	-	-	-	-
David W. Lewis,	Boston, Mass.,	-	-	-	-
Berry & Ferguson,	Boston, Mass.,	-	-	-	-
E. E. Locke,	Malden, Mass.,	-	-	-	-
Barbour-Stockwell Co.,	Cambridgeport, Mass.,	-	-	-	-
Osgood & Hart,	Boston, Mass.,	-	-	-	-
Sessions Foundry Co.,	Bristol, Conn ,	-	-	-	-
Bridgewater Foundry, Machine and Rolling Mill Co.,	Bridgewater, Mass.,	-	-	-	-

* Per long ton.

† Bid accepted.

TABLE F. — MISCELLANEOUS BIDS UPON THE NORTH METROPOLITAN SYSTEM — *Concluded.*

NAME OF BIDDER.	Address.	DRAIN PIPE.				CASTINGS, MAN-HOLE FRAMES AND COVERS.	
		CHELSEA AND EVERETT EXTENSION.		WAKEFIELD BRANCH EXTENSION.			
		Bids opened Sept. 24, 1900.		Bids opened Sept. 24, 1900.		Bids opened Sept. 24, 1900.	
Henry T. Woods,	Boston, Mass.,	–	–	–	–	–	–
Wellington-Wild Coal Co.,	Boston, Mass.,	–	–	–	–	–	–
Metropolitan Coal Co.,	Boston, Mass.,	–	–	–	–	–	–
Curtis & Pope Lumber Co.,	Boston, Mass ,	60 per cent. discount Akron or National Company pipe.		60 per cent. discount Akron or National Company pipe.		–	–
Harry Stevens, agent,	Melrose, Mass.,	64½ per cent. discount National Company pipe.		64½ per cent. discount National Company pipe.		–	–
Portland Stoneware Co.,	Boston, Mass.,	65 per cent. discount Portland pipe,		65 per cent. discount Portland pipe,		–	–
Fisk & Co.,	Boston, Mass.,	67 per cent. discount Akron pipe,		67 per cent. discount Akron pipe,		–	–
David W. Lewis,	Boston, Mass.,	68 per cent. discount Akron Hill Company or National Company pipe		68 per cent. discount Akron Hill Company or National Company pipe.		–	–
Berry & Ferguson,	Boston, Mass.,	69 per cent. discount Akron pipe,*		68 per cent. discount Akron pipe,		–	–
E. E. Locke,	Malden, Mass ,	–	–	68 per cent. discount Akron pipe,*		–	–
Barbour-Stockwell Co.,	Cambridgeport, Mass.,	–	–	–	–	$2 62½ per hundred pounds.	
Osgood & Hart,	Boston, Mass.,	–	–	–	–	1 73 per hundred pounds.	
Sessions Foundry Co.,	Bristol, Conn.,	–	–	–	–	1 48 per hundred pounds.	
Bridgewater Foundry, Machine and Rolling Mill Co.	Bridgewater, Mass.,	–	–	–	–	1 37½ per hundred pounds.*	

* Bid accepted.

TABLE G. — BIDS FOR CONSTRUCTION OF CHELSEA AND EVERETT OUTLETS, NORTH METROPOLITAN SYSTEM.

NAME OF BIDDER.	Address.	CHELSEA AND EVERETT OUTLETS. BIDS OPENED SEPT. 17, 1900.	
		Section 56.	Section 57.
Strout & Foster, ...	Chelsea, Mass., . .	$38,889 50	$26,537 00
Bruno & Salomone, ...	Boston, Mass., . .	38,585 00	25,893 00
Jones & Meehan, ...	Boston, Mass., . .	38,050 00	30,670 00
Old Colony Construction Co., .	Boston, Mass., . .	36,076 00	24,141 50
Charles G. Craib, ...	Winthrop, Mass., .	32,815 00	24,202 50
Beckwith & Quackenbush, . .	Boston, Mass., . .	32,370 00	27,695 00
H. A. Hanscom & Co., . . .	West Medford, Mass.,	31,917 50*	23,847 00*
C. E. Trumbull & Co., . . .	Boston, Mass., . .	-	26,167 00
Richard Falvey, ...	Somerville, Mass., .	-	25,627 50

* Bid accepted.

Table H. — Contracts Awarded.

Chelsea and Everett Outlets, North Metropolitan System.

SECTION.	Location.	Advertised for Bids.	Bids opened.	Number of Bids.	Highest.	Lowest.	Contract awarded to —	Residence.	Work begun.	To be completed.	Length of Section (Feet).
		1900.	**1900.**								
Section 56,	Chelsea, Mass., .	Aug. 21,	Sept. 17,	7	$38,889 50	$31,917 50	H. A. Hanscom & Co., .	West Medford, Mass.	Sept. 25, 1900,	Aug. 1, 1901,	2,890
Section 57,	Chelsea, Mass., .	Aug. 21,	Sept. 17,	9	30,670 00	23,847 00	H. A. Hanscom & Co., .	West Medford, Mass.	Sept. 26, 1900,	Aug. 1, 1901,	5,430
					High-level Sewer.						
		1899.	**1899.**								
Section 65,	Hyde Park, Mass ,	Sept. 13,	Oct. 7,	15	$76,045 00	$38,610 00	Beckwith & Quackenbush,	Mohawk, N. Y., .	Mar. 3, 1900,	Oct. 1, 1900,	900
Section 66,	Hyde Park, Mass.,	Sept. 13,	Oct. 7,	10	398,400 00	215,600 00	E. W. & John J. Everson, .	Providence, R. I., .	Dec. 22, 1899,	Oct. 1, 1901,	5,300
Section 68,	Hyde Park and West Roxbury, Mass.	Sept. 13,	Oct. 7,	16	115,095 00	68,843 00	Beckwith & Quackenbush,	Mohawk, N. Y., .	Nov. 20, 1899,	Mar. 1, 1901,	2,735
Section 69,	West Roxbury, Mass.	Sept. 13,	Oct. 7,	8	119,912 50	86,125 00	Beckwith & Quackenbush,	Mohawk, N. Y., .	Nov. 20, 1899,	Mar. 1, 1901,	2,600
		1900.	**1900.**								
Section 70,	West Roxbury, Mass.	Mar. 20,	April 7,	18	148,966 00	89,492 00	Charles Linehan, . . .	Cambridgeport, Mass.	April 25, 1900,	Dec. 1, 1901,	3,740
Section 71,	West Roxbury, Mass.	Mar. 20,	April 7,	9	114,305 00	70,100 00	Charles F. Taylor & Co., .	Syracuse, N. Y., .	May 16, 1900,	Dec. 1, 1901,	2,065
Section 72,	West Roxbury, Mass.	Sept. 7,	Sept. 29,	6	162,306 50	103,101 00	Jones & Meehan, . . .	Boston, Mass., .	Oct. 8, 1900,	July 1, 1901,	3,010
Section 74,	West Roxbury, Mass.	Aug. 28,	Sept. 17,	4	163,100 00	129,965 00	Harry P. Nawn, . . .	Boston, Mass., .	Sept. 26, 1900,	Oct. 1, 1902,	2,985
Section 75,	Roxbury, Mass., .	Mar. 20,	April 7,	6	197,890 00	79,315 00	Shaller & Schniglau Co., .	Chicago, Ill., .	May 17, 1900,	April 1, 1902,	3,070

TABLE I. — LIST OF CASES PENDING AGAINST THE COMMONWEALTH, GROWING OUT OF THE CONSTRUCTION OF THE METROPOLITAN SEWER.

North Metropolitan System.

Boston *v.* Commonwealth (land damage, Deer Island), petition, $500,000.

Connolly *v.* Commonwealth (action of tort for personal injuries to employee of contractor, Deer Island), tort, $10,000.

Sheehan *v.* Commonwealth (Medford), breach of contract, $11,883.80.

Stone *et als.* *v.* Commonwealth (land damage, Everett and Charlestown), petition.

Stone *et als.* *v.* Commonwealth (land damage, Everett and Charlestown), petition.

Stone *et als.* *v.* Commonwealth (land damage, Everett and Charlestown), petition.

Stone *et als.* *v.* Commonwealth (land damage, Everett and Charlestown), petition.

Stone *et als.* *v.* Commonwealth (use and occupation), $1,979.17.

Neponset Valley System.

Boston *v.* Kingman *et al.* (West Roxbury), tort, $10,000.

Boston *v.* Commonwealth (West Roxbury), petition.

Evangelical Church *v.* Sewerage Commission (land damage, West Roxbury), petition.

Holyhood Cemetery *v.* Commonwealth (land damage, West Roxbury), petition.

Krug *v.* Commonwealth (land damage, West Roxbury), petition.

Nawn *v.* Commonwealth (sections 13–16), breach of contract, $13,200.

Noon *v.* Commonwealth (land damage, West Roxbury), petition.

Rohan *v.* Commonwealth (injury by blasting during construction of sewer, Dedham), tort, $3,000.

Richards *et al.* *v.* Commonwealth (land damage, West Roxbury), petition.

TABLE J.—LIST OF CONNECTIONS TO DATE (SEPT. 30, 1900).

North Metropolitan System.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Aug. 24, 1895,	Arlington,	Henderson Street, at Alewife Brook,	10 inch,	Sept. 20, 1895.
May 9, 1896,	Arlington,	At the end of the metropolitan sewer in Decatur Street,	18 inch,	June 20, 1896.
May 1, 1897,	Arlington,	Broadway, at Alewife Brook, near town line,	15 inch,	June 19, 1897.
Sept. 3, 1898,	Arlington,	Lowell and Bow streets,	8 inch,	Aug. 30, 1898.
Sept. 24, 1898,	Arlington,	Park and Massachusetts avenues,	5 inch,	Sept 27, 1898.
Sept. 24, 1898,	Arlington,	Massachusetts and Park avenues,	5 inch,	Sept. 21, 1898.
Sept. 24, 1898,	Arlington,	Park and Massachusetts avenues,	5 inch,	Sept. 24, 1898.
Oct. 15, 1898,	Arlington,	Man-hole at junction of Massachusetts and Park avenues,	10 inch,	Sept. 21, 1898.
Oct. 15, 1898,	Arlington,	Park Avenue, near Boston & Maine Railroad,	12 inch,	-
Oct. 22, 1898,	Arlington,	Massachusetts Avenue, near Station 33 + 78.3,	5 inch,	Oct. 21, 1898.
Nov. 5, 1898,	Arlington,	Massachusetts Avenue, near man-hole at junction of Massachusetts Avenue and Mystic Street,	5 inch,	Nov. 12, 1898.
Nov. 5, 1898,	Arlington,	Park Avenue, 100 feet south of Boston & Maine Railroad,	12 inch,	Nov. 9, 1898.
Dec. 3, 1898,	Arlington,	Medford Street, at junction of Chestnut Street,	5 inch,	Dec. 10, 1898.
Dec. 3, 1898,	Arlington,	Chestnut Street, 200 feet west of man-hole at its junction with Medford Street,	5 inch,	Dec. 12, 1898.
Dec. 10, 1898,	Arlington,	Chestnut Street, 297.5 feet west of man-hole at junction of Chestnut and Medford streets,	5 inch,	Dec. 15, 1898.
Dec. 24, 1898,	Arlington,	Twenty public connections in operation Sept. 17, 1898, along that portion of the local sewers of the town of Arlington purchased by the Metropolitan Sewerage Commission, as authorized by chapter 520, Acts of 1897,	-	-
Dec. 24, 1898,	Arlington,	Twenty-five special house connections in operation Sept. 17, 1898, along that portion of the local sewers of the town of Arlington purchased by the Metropolitan Sewerage Commission, as authorized by chapter 520, Acts of 1897,	5 inch,	-
April 15, 1899,	Arlington,	Lewis Avenue, 342.1 feet east of man-hole at Medford Street,	5 inch,	Apr. 10, 1899.
April 22, 1899,	Arlington,	Lewis Avenue, 429.1 feet east of man-hole at junction of Medford Street,	5 inch,	Apr. 20, 1899.
April 22, 1899,	Arlington,	Lewis Avenue, 375.3 feet east of man-hole at junction of Medford Street,	5 inch,	Apr. 17, 1899.

TABLE J. — *List of Connections, etc.* (*North Metropolitan System*) — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
April 29, 1899,	Arlington,	Massachusetts Avenue, 7.7 feet east of man-hole near Hobb's Court,	5 inch,	May 9, 1899.
April 29, 1899,	Arlington,	Massachusetts Avenue, near junction of Appleton Street,	5 inch,	To be made.
May 13, 1899,	Arlington,	Massachusetts Avenue, near its junction with Vine Street,	8 inch,	May 22, 1899.
June 16, 1899,	Arlington,	Massachusetts Avenue, near its junction with Mt. Vernon Street,	5 inch,	June 15, 1899.
July 8, 1899,	Arlington,	At man-hole at Alewife Brook, near Arlington Branch, Boston & Maine Railroad,	18 inch,	Aug. 29, 1899.
Sept. 2, 1899,	Arlington,	Massachusetts Avenue, 101.7 feet east of man-hole at the Lexington town line,	5 inch,	Sept. 26, 1899.
Sept. 2, 1899,	Arlington,	Massachusetts Avenue, 198.2 feet west of man-hole at its junction with Mill Street,	5 inch,	Sept. 5, 1899.
Sept. 9, 1899,	Arlington,	Massachusetts Avenue, 76 feet west of man-hole at its junction with Crusher Lane,	5 inch,	Sept. 12, 1899.
Oct. 7, 1899,	Arlington,	Massachusetts Avenue, 14.35 feet west of man-hole at junction of Academy Street and Massachusetts Avenue,	5 inch,	Oct. 25, 1899.
Oct. 13, 1899,	Arlington,	Massachusetts Avenue, 164.18 feet west of man-hole at junction of Highland Avenue and Massachusetts Avenue,	5 inch,	Not made.
Oct. 28, 1899,	Arlington,	Massachusetts Avenue, 133.54 feet west of man-hole at junction of Bartlett Avenue and Massachusetts Avenue,	5 inch,	Nov. 3, 1899.
Dec. 2, 1899,	Arlington,	Massachusetts Avenue, 528.9 feet west of man-hole at junction of Park Avenue and Massachusetts Avenue for Elevated Railroad car-house,	5 inch,	Nov. 28, 1899.
April 21, 1900,	Arlington,	Massachusetts Avenue, 88.8 feet west of first man-hole west of Brattle Street,	5 inch,	April 28, 1900.
April 28, 1900,	Arlington,	Lewis Avenue, 104.7 feet west of first man-hole west of Franklin Street,	5 inch,	April 30, 1900.
May 5, 1900,	Arlington,	Decatur Street, 72.9 feet east of man-hole at junction of Decatur Street and North Union Street,	5 inch,	May 10, 1900.
May 12, 1900,	Arlington,	Massachusetts Avenue, 27.7 feet east of man-hole at Lexington town line,	5 inch,	May 14, 1900.
May 12, 1900,	Arlington,	Park Avenue, 89.2 feet south of man-hole at railroad crossing,	5 inch,	May 22, 1900.
June 29, 1900,	Arlington,	Massachusetts Avenue, 11.1 feet west of man-hole at junction of Massachusetts Avenue and Walnut Street,	5 inch,	July 7, 1900.

TABLE J. — *List of Connections, etc. (North Metropolitan System)* — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Aug. 13, 1900,	Arlington,	78.1 feet west of first man-hole east from junction of Massachusetts Avenue and Vine Street,	8 inch,	Not made.
Aug. 13, 1900,	Arlington,	Massachusetts Avenue, 6 feet west of first man-hole east of junction of Massachusetts Avenue and Vine Street,	5 inch,	Not made.
Aug. 6, 1900,	Arlington,	At the man-hole, junction of Lewis Avenue and Medford Street,	8 inch,	July 20, 1900.
Sept. 24, 1900,	Arlington,	174.2 feet west of man-hole at Crusher Lane and Massachusetts Avenue,	5 inch,	Sept. 19, 1900.
Mar. 2, 1895,	Belmont,	Near Hills Crossing,	15 inch,	June 13, 1895.
Aug. 1, 1896,	Boston,*	About 200 feet south of shaft at the southerly end of siphon at man-hole in Alford Street, in the park,	15 inch,	Sept. 28, 1896.
Oct. 10, 1896,	Boston,*	Navy Yard, on the northerly side of the metropolitan sewer in said yard,	15 inch,	Nov. 1, 1896.
Dec. 5, 1896,	Boston,*	On Chelsea Street, opposite Vine Street,	15 inch,	Mar. 2, 1897.
Mar. 27, 1897,	Boston,*	Water Street, near Wapping Street,	15 inch,	Nov. 18, 1898.
Mar. 27, 1897,	Boston,*	Chelsea Street, near Medford Street,	24 inch,	Mar. 30, 1897.
June 19, 1897,	Boston,*	Rutherford Avenue, near Dunstable Street,†	24 inch,	June 25, 1897.
Nov. 11, 1899,	Boston,*	Station 82+68, near man-hole at Station 82+74 of Metropolitan Sewerage Commission, U. S. Navy Yard,	12 inch,	Nov. 5, 1899.
Aug. 6, 1900,	Boston,*	U. S. Navy Yard, at 12-inch Y branch near Station 85.88 of sewer,	12 inch,	Not made.
Sept. 14, 1895,	Boston,‡	Orleans and Decatur streets,†	16 inch,	Oct. 11, 1895.
Nov. 30, 1895,	Boston,‡	Butler Avenue, Orient Heights,	12 inch,	Jan. 23, 1896.
May 23, 1896,	Boston,‡	Condor Street, near Meridian Street,	15 inch,	Aug. 14, 1896.
Dec. 12, 1896,	Boston,‡	Border Street, near Decatur Street,†	12 inch,	Feb. 26, 1897.
Nov. 28, 1896,	Boston,‡	At the junction of Bremen and Porter streets,†	18 inch,	Nov. 30, 1896.
Dec. 5, 1896,	Boston,‡	Condor Street, near Meridian Street,	12 inch,	Jan. 26, 1897.
Jan. 19, 1897,	Boston,‡	Border Street, near Eutaw Street,†	12 inch,	Apr. 2, 1897.
Jan. 19, 1897,	Boston,‡	Border Street, near Lexington Street,†	10 inch,	Apr. 27, 1897.
Feb. 13, 1897,	Boston,‡	Butler Avenue, corner Saratoga Street (temporary),	-	-

* Charlestown district. † Connected, but not in operation at this date.
‡ East Boston district.

TABLE J. — *List of Connections, etc. (North Metropolitan System)* — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
June 12, 1897,	Boston,*	New Street, at Sumner Street,	12 inch,	June 14, 1897.
June 12, 1897,	Boston,*	House, Bennington Street, near Saratoga Street,	-	-
July 31, 1897,	Boston,*	Maverick Street, near Jeffries Street,†	12 inch,	July 30, 1897.
July 31, 1897,	Boston,*	Maverick Street, near Cottage Street,†	12 inch,	Sept. 9, 1897.
Aug. 1, 1896,	Boston,‡	About Station 19+20,	8 inch,	Aug. 21, 1896.
Aug. 1, 1896,	Boston,‡	Station 12+80,	8 inch,	To be made.
Sept. 18, 1897,	Boston,‡	Station 22+80,	8 inch,	Oct. 12, 1897.
Oct. 2, 1897,	Boston,*	Maverick and Lamson streets,	12 inch,	Oct. 8, 1897.
Dec. 4, 1897,	Boston,*	Jeffries and Sumner streets,	12 inch,	Dec. 23, 1897.
Jan. 15, 1898,	Boston,*	Marginal and Ruth streets,	12 inch,	Jan. 19, 1898.
Mar. 12, 1898,	Boston,§	Roland and Crescent streets,	12 inch,	Mar. 28, 1898.
Mar. 26, 1898,	Boston,*	Marginal and Cottage streets,	12 inch,	Apr. 26, 1898.
April 23, 1898,	Boston,*	Eagle Square,	18 inch,	June 13, 1898.
April 23, 1898,	Boston,§	Front Street, near Mason Street,	12 inch,	May 5, 1898.
June 18, 1898,	Boston,§	Front Street, near Union Street,	12 inch,	July 17, 1898.
July 30, 1898,	Boston,§	Water Street, near Gray Street,	15 inch,	Aug. 2, 1898.
Oct. 15, 1898,	Boston,§	Water Street, near Charles River Avenue,	12 inch,	Oct. 15, 1898.
Dec. 3, 1898,	Boston,§	Main Street, near Beach Street,	18 inch,	Dec. 16, 1897.
Mar. 11, 1899,	Boston,§	Chelsea Street, near Navy Yard,	6 inch,	Apr. 4, 1899.
June 24, 1899,	Boston,*	Chelsea Street, near Addison Street,	12 inch,	July 28, 1899.
July 29, 1899,	Boston,§	In United States Navy Yard,	12 inch,	June 23, 1899.
Oct. 4, 1895,	Cambridge,	Corner Portland and Binney streets,	48 inch,	Dec. 4, 1894.
May 4, 1895,	Cambridge,	Massachusetts Avenue and Alewife Brook,	15 inch,	June 14, 1895.
May 4, 1895,	Cambridge,	Belmouth Rindge Avenue, formerly Spruce Street,	15 inch,	June 26, 1895.
May 4, 1895,	Cambridge,	Concord Avenue,	15 inch,	Aug. 21, 1895.
July 6, 1895,	Cambridge,	Mt. Auburn and Lowell streets,	27×28 in.	Aug. 24, 1895.
Aug. 10, 1895,	Cambridge,	Mt. Auburn Street, corner Willard Street,	12 inch,	Oct. 11, 1895.
Oct. 4, 1895,	Cambridge,	Near Concord Avenue, for Niles Bros' slaughtering establishment,	8 inch,	Nov. 30, 1895.
Oct. 4, 1895,	Cambridge,	Mt. Auburn Street, corner Hawthorn Street,	18 inch,	Dec. 12, 1895.
Mar. 14, 1896,	Cambridge,	Dunster Street,	12 inch,	June 1, 1896.
Mar. 14, 1896,	Cambridge,	Corner Dyke and Plympton streets,	30 inch,	June 30, 1896.

* East Boston district.
‡ Deer Island.
† Connected, but not in operation at this date.
§ Charlestown district.

TABLE J. — *List of Connections, etc. (North Metropolitan System)* — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Oct. 19, 1895,	Cambridge, .	Brookline Street, near Cottage Farm station, ...	10 inch,	Aug. 1, 1896.
July 22, 1896,	Cambridge, .	In private land near Alewife Brook, near Massachusetts Avenue (Tannery Brook connection), .	15 inch,	Aug. 28, 1896.
Mar. 14, 1896,	Cambridge, .	Pearl Street, ...	20 inch,	Aug. 31, 1896.
Aug. 10, 1895,	Cambridge, .	North side of Mt. Auburn Street, at Sparks Street, ...	15 inch,	Oct. 3, 1895.
Mar. 14, 1896,	Cambridge, .	Waverly and Talbot streets, . .	20 inch,	June 24, 1897.
Mar. 14, 1896,	Cambridge, .	Western Avenue, ...	22 inch,	Nov. 30, 1896.
Mar. 14, 1896,	Cambridge, .	Eliot Square, ...	15 inch,	Oct. 24, 1896.
Mar. 14, 1896,	Cambridge, .	Pleasant Street, ...	20 inch,	Oct. 5, 1896.
Sept. 17, 1898,	Cambridge, .	Albany Street and Massachusetts Avenue, ...	18 inch,	June 10, 1899.
July 22, 1899,	Cambridge, .	Albany Street, near Pacific Street,	28 inch,	Aug. 31, 1899.
Oct. 24, 1896,	Chelsea, . .	Second Street, near Cypress Street,	15 inch,	Aug. 24, 1897.
Mar. 13, 1897,	Chelsea, . .	Second Street, near Cypress Street,	6 inch,	May 3, 1897.
June 19, 1897,	Chelsea, . .	Marginal Street, corner Hawthorn Street, ...	12 inch,	Sept. 9, 1897.
June 19, 1897,	Chelsea, . .	Marginal Street, near Shurtleff Street, ...	10 inch,	Sept. 8, 1897.
July 3, 1897,	Chelsea, . .	Second Street (temporary only for Metropolitan Water Board), .	-	Aug. 24, 1897.
Oct. 30, 1897,	Chelsea, . .	Second Street, at Spruce Street, .	18 inch,	Nov. 17, 1897.
Nov. 18, 1899,	Chelsea, . .	Eastern Avenue, about 50 feet south-easterly of Willoughby Street, ...	18 inch,	Dec. 27, 1899.
April 7, 1900,	Chelsea, . .	Marginal Street, about 60 feet east of the easterly line of Shawmut Street, ...	6 inch,	May 5, 1900.
Mar. 24, 1894,	Everett, . .	Under tracks of Boston & Maine Railroad, near East Everett station, ...	24 inch,	July 3, 1894.
April 20, 1895,	Everett, . .	West Everett, near Faxon's Foundry, ...	20 inch,	July 10, 1895.
Sept. 18, 1897,	Everett, . .	Second Street (temporary only for Metropolitan Water Board), .	-	Sept. 12, 1897.
Jan. 29, 1898,	Everett, . .	Fleet Street Court, Station 12 + 44.35 on Section 17, north metropolitan sewer, ...	15 inch,	Never made.
Sept. 2, 1899,	Everett, . .	At the junction of Bryant and Rich streets, at the Malden line, .	15 inch,	Aug. 2, 1899.
April 7, 1900,	Everett, . .	Broadway, at Dexter Street, . .	24 inch,	Not made.
Nov. 4, 1893,	Malden, . .	Corner Charles and Middlesex streets, ...	25×38 in.	Jan. 9, 1894.
May 5, 1894,	Malden, . .	Extension of Pearl Street, near boundary line between Malden and Medford, ...	24 inch,	May 20, 1894.

TABLE J.— *List of Connections, etc.* (*North Metropolitan System*) — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Aug. 25, 1894,	Malden, . .	Mountain Avenue, ...	15 inch,	Dec. 17, 1894.
Nov. 3, 1894,	Malden, . .	Medford Street, corner Canal Street, ...	15 inch,	Mar. 30, 1895.
July 3, 1897,	Malden, . .	Jackson Street (temporary), . .	12 inch,	July 24, 1897.
Sept. 10, 1898,	Malden, . .	Bryant and Boylston streets, . .	8 inch,	Oct. 7, 1898.
Oct. 15, 1898,	Malden, . .	Bryant Street (house connection), ...	6 inch,	Oct. 15, 1898.
Nov. 5, 1898,	Malden, . .	Bryant Street, south of Cross Street, ...	5 inch,	Nov. 5, 1898.
Dec. 3, 1898,	Malden, . .	Bryant Street, north of man-hole at Cross Street, ...	6 inch,	To be made.
Dec. 24, 1898,	Malden, . .	Sixteen public connections in operation Oct. 8, 1898, along that portion of the local sewers of the city of Malden purchased by the Metropolitan Sewerage Commission, as authorized by chapter 215 of the Acts of 1898, . .	-	-
Dec. 24, 1898,	Malden, . .	Seventy-two special house connections in operation Oct. 8, 1898, along that portion of the local sewers of the city of Malden purchased by the Metropolitan Sewerage Commission, as authorized by chapter 215 of the Acts of 1898, ...	5 inch,	-
April 29, 1899,	Malden, . .	Eastern Avenue (house connection), ...	6 inch,	Apr. 29, 1899.
April 29, 1899,	Malden, . .	Bryant Street, near Cross Street, .	6 inch,	May 2, 1899.
June 10, 1899,	Malden, . .	Bryant Street, south of Cross Street, ...	6 inch,	June 12, 1899.
June 24, 1899,	Malden, . .	House, Eastern Avenue, . .	6 inch,	July 1, 1899.
Sept. 2, 1899,	Malden, . .	Bryant Street, near Cross Street, .	6 inch,	Aug. 10, 1899.
Sept. 2, 1899,	Malden, . .	Bryant Street, ...	6 inch,	Aug. 29, 1899.
Oct. 13, 1899,	Malden, . .	Bryant Street, Station 10+06.40, south of Cross Street, . . .	6 inch,	Oct. 13, 1899.
Oct. 21, 1899,	Malden, . .	Eastern Avenue, Station 18+50.00, ...	6 inch,	Oct. 17, 1899.
Feb. 3, 1900,	Malden, . .	Bryant Street, 1,160.80 feet south of Cross Street man-hole, . .	6 inch,	Feb. 7, 1900.
April 7, 1900,	Malden, . .	Eastern Avenue, 83.92 feet west of man-hole at Wyeth Street, . .	6 inch,	Apr. 7, 1900.
April 21, 1900,	Malden, . .	184 Bryant Street, 365.6 feet south of Cross Street, ...	6 inch,	Apr. 24, 1900.
May 12, 1900,	Malden, . .	251 Eastern Avenue, Station 35+57.9, between Franklin and Bryant streets, ...	6 inch,	May 14, 1900.
June 29, 1900,	Malden, . .	Bryant Street, 1,212.60 feet south of Cross Street man-hole, . .	6 inch,	June 29, 1900.
Aug. 6, 1900,	Malden, . .	250 Bryant Street, 11+10.6 feet south of Cross Street, . . .	6 inch,	Aug. 12, 1900.

TABLE J. — *List of Connections, etc. (North Metropolitan System)* — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Aug. 6, 1900,	Malden, . .	Bryant Street man-hole, at intersection of Harvard and Bryant streets, ...	8 inch,	Aug. 12, 1900.
Aug. 6, 1900,	Malden, . .	Bryant Street man-hole, at intersection of Essex and Bryant streets, ...	8 inch,	Aug. 11, 1900.
Aug. 13, 1900,	Malden, . .	Bryant Street, 51.62 feet north of metropolitan man-hole at Cross and Bryant streets, . . .	6 inch,	Aug. 25, 1900.
May 26, 1894,	Medford, .	Riverside Avenue, near to and east of Gravelly Creek, . . .	18 inch,	June 18, 1894.
May 26, 1894,	Medford, .	South side of the metropolitan sewer in Medford Square, . .	12 inch,	June 13, 1894.
May 26, 1894,	Medford, .	Riverside Avenue, junction of Spring Street, ...	15 inch,	Oct. 19, 1894.
May 26, 1894,	Medford, .	Riverside Avenue, junction of Park and Marine avenues, . .	12 inch,	Nov. 9, 1894.
Aug. 25, 1894,	Medford, .	In private land at the west end of Canal Street and Boston Avenue,	12 inch,	Sept. 12, 1894.
Aug. 25, 1894,	Medford, .	Corner of Prospect and Cottage streets, ...	12 inch,	Sept. 14, 1894.
Aug. 25, 1894,	Medford, .	In private land, about 460 feet from the corner of Winthrop and High streets, ...	12 inch,	Nov. 20, 1894.
July 6, 1895,	Medford, .	Junction Middlesex Avenue and Third Street, Wellington district, ...	15 inch,	July 16, 1895.
July 6, 1895,	Medford, .	Craddock Avenue, Wellington district, ...	12 inch,	Sept. 18, 1895.
Sept. 7, 1895,	Medford, .	Mystic Avenue, at end of Section 35, ...	20 inch,	Jan. 6, 1896.
Sept. 7, 1895,	Medford, .	High Street, rear of St. Joseph's Church, ...	10 inch,	To be made.
July 1, 1896,	Medford, .	Boston Avenue, ...	8 inch,	July 23, 1896.
July 22, 1896,	Medford, .	Jerome Street, West Medford, .	12 inch,	Oct. 29, 1896.
April 17, 1897,	Medford, .	House of R. T. Howes, Prescott Street, near Mystic Street (temporary), ...	6 inch,	May 17, 1897.
April 17, 1897,	Medford, .	Houses of Fuller and Forest, at a point about 200 feet west of Bradbury Avenue (temporary),	6 inch,	May 17, 1897.
May 15, 1897,	Medford, .	At west end of Madison Street, .	15 inch,	July 17, 1897.
May 29, 1897,	Medford, .	Riverside Avenue, opposite Locust Street, ...	15 inch,	June 26, 1897.
Nov. 20, 1897,	Medford, .	Riverside Avenue, near Spring Street, house of Eugene W. Keay, ...	6 inch,	Nov. 30, 1897.
Nov. 20, 1897,	Medford, .	Prescott Street, near Allston Street, house of Mrs. Estelle Z. Beakman, ...	6 inch,	Nov. 29, 1897.
May 7, 1898,	Medford, .	Near Hastings Lane, . . .	8 inch,	May 17, 1898.

TABLE J. — *List of Connections, etc.* (*North Metropolitan System*) — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Sept. 3, 1898,	Medford,	House, 350 Riverside Avenue,	5 inch,	Aug. 23, 1898.
April 22, 1899,	Medford,	Prescott Street, at the centre of Mystic Street (temporary),	6 inch,	Apr. 27, 1899.
April 14, 1900,	Medford,	314 Riverside Avenue, about 300 feet west of Spring Street,	5 inch,	Apr. 24, 1900.
Aug. 6, 1900,	Medford,	Riverside Avenue opposite Hall Street,	12 inch,	Sept. 11, 1900.
Sept. 24, 1900,	Medford,	Opposite Hillside Avenue and about 60 feet westerly from High Street,	8 inch,	Not made.
July 21, 1894,	Melrose,	Corner Wyoming Avenue and Pleasant Street,	20 inch,	Dec. 15, 1894.
Sept. 5, 1896,	Melrose,	Corner Gould and Pleasant streets,	15 inch,	Sept. 25, 1896.
Sept. 5, 1896,	Melrose,	Corner Gilbert and Pleasant streets,	12 inch,	Oct. 5, 1896.
May 29, 1897,	Melrose,	House 45 Myrtle Street (temporary),	5 inch,	May 19, 1897.
Dec. 19, 1896,	Melrose,	At Station 29+05, Essex Street,	5 inch,	Dec. 21, 1896.
May 1, 1897,	Melrose,	Myrtle Street, about 210 feet north of Foster Street,	5 inch,	May 11, 1897.
May 29, 1897,	Melrose,	House 23 Grove Street, west of man-hole at Myrtle Street,	5 inch,	May 19, 1897.
May 29, 1897,	Melrose,	House, 19 Grove Street, near man-hole at Mystic Street,	5 inch,	May 19, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Warren Street,	8 inch,	Dec. 7, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Gordon Street,	6 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Warren Street,	6 inch,	Dec. 9, 1897.
Dec. 4, 1897,	Melrose,	Melrose and Belmont streets,	6 inch,	Dec. 7, 1897.
Dec. 4, 1897,	Melrose,	Melrose and Tremont streets,	6 inch,	Dec. 8, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Mendum Street,	6 inch,	Dec. 8, 1897.
Dec. 4, 1897,	Melrose,	Franklin and Greenwood streets,	8 inch,	Dec. 7, 1897.
Dec. 4, 1897,	Melrose,	Tremont and Melrose streets,	6 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose,	Vinton Street and Brunswick Park,	8 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Vinton Street,	6 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose,	House 25 Myrtle Street,	5 inch,	Dec. 24, 1897.
Dec. 4, 1897,	Melrose,	House 160 Franklin Street,	5 inch,	Dec. 13, 1897.
Dec. 18, 1897,	Melrose,	House of S. E. Benson, on Tremont Street,	5 inch,	Dec. 21, 1897.
April 23, 1898,	Melrose,	House 22 Greenwood Street,	5 inch,	Oct. 26, 1898.
April 23, 1898,	Melrose,	House 199 Tremont Street,	5 inch,	Apr. 29, 1898.

TABLE J. — *List of Connections, etc.* (*North Metropolitan System*) — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
June 11, 1898,	Melrose, . .	House 121 Essex Street, . .	5 inch,	June 14, 1898.
June 18, 1898,	Melrose, . .	House 1 Franklin Terrace, . .	5 inch,	June 14, 1898.
June 18, 1898,	Melrose, . .	House 2 Franklin Terrace, . .	5 inch,	June 14, 1898.
June 18, 1898,	Melrose, . .	House 3 Franklin Terrace, . .	5 inch,	June 14, 1898.
July 30, 1898,	Melrose, . .	House 199 Essex Street, . .	5 inch,	Aug. 3, 1898.
July 30, 1898,	Melrose, . .	House Franklin Terrace, . .	5 inch,	June 14, 1898.
Sept. 24, 1898,	Melrose, . .	Near Franklin Street, . . .	8 inch,	Nov. 25, 1898.
Oct. 22, 1898,	Melrose, . .	Belmont Street, 100 feet south of Franklin Street, ...	5 inch,	Nov. 1, 1898.
Dec. 3, 1898,	Melrose, . .	Franklin Street, between Belmont and Greenwood streets, Melrose Highlands, ...	5 inch,	Dec. 13, 1898.
Dec. 24, 1898,	Melrose, . .	Thirteen public connections in operation Nov. 21, 1896, along that portion of the local sewers of the town of Melrose purchased by the Metropolitan Sewerage Commission, as authorized by chapter 414, Acts of 1896, and chapter 88 of the Acts of 1897, .	-	-
Dec. 24, 1898,	Melrose, . .	Thirty special house connections in operation Nov. 21, 1896, along that portion of the local sewers of the town of Melrose purchased by the Metropolitan Sewerage Commission, as authorized by chapter 414, Acts of 1896, and chapter 88, Acts of 1897, . .	5 inch,	-
May 6, 1899,	Melrose, . .	Tremont Street, premises 110, .	5 inch,	June 21, 1899.
May 6, 1899,	Melrose, . .	House 328 Franklin Street, . .	5 inch,	May 16, 1899.
May 6, 1899,	Melrose, . .	House 334 Franklin Street, . .	5 inch,	June 22, 1899.
May 6, 1899,	Melrose, . .	House 345 Franklin Street, . .	5 inch,	June 22, 1899.
May 6, 1899,	Melrose, . .	Tremont Street, to premises 93 Lake Avenue, ...	5 inch,	May 23, 1899.
May 20, 1899,	Melrose, . .	Brunswick Park, west of man-hole at Brunswick Way, . . .	5 inch,	May 23, 1899.
June 16, 1899,	Melrose, . .	House, Greenwood Street, . .	5 inch,	June 23, 1899.
June 16, 1899,	Melrose, . .	Melrose Street extension, north of man-hole in Warren Street, .	5 inch,	To be made.
June 16, 1899,	Melrose, . .	Melrose Street extension, west of man-hole in Warren Street, .	5 inch,	June 21, 1899.
June 16, 1899,	Melrose, . .	Franklin Street, near Belmont Street, ...	5 inch,	June 22, 1899.
July 1, 1899,	Melrose, . .	House, Wyoming Avenue, . .	5 inch,	June 23, 1899.
July 15, 1899,	Melrose, . .	Myrtle Street, near Essex Street,	5 inch,	June 26, 1899.
July 15, 1899,	Melrose, . .	Belmont Street, near Belmont Place, ...	5 inch,	July 7, 1899.
July 15, 1899,	Melrose, . .	Franklin Street, near Belmont Street, ...	5 inch,	June 14, 1899.

TABLE J. — *List of Connections, etc. (North Metropolitan System)* — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
July 15, 1899,	Melrose, . .	Melrose Street, west of man-hole in Tremont Street, . . .	5 inch,	June 23, 1899.
July 22, 1899,	Melrose, . .	Private land between Melrose Street extension and Franklin Terrace, ...	5 inch,	Sept. 15, 1899.
July 22, 1899,	Melrose, . .	Melrose Street extension, west of man-hole at Warren Street, .	5 inch,	July 18, 1899.
Sept. 2, 1899,	Melrose, . .	Tremont Street, Melrose Highlands,	5 inch,	Aug. 7, 1899.
Sept. 2, 1899,	Melrose, . .	Melrose Street, west of man-hole at Tremont Street, . . .	5 inch,	Aug. 9, 1899.
Sept. 2, 1899,	Melrose, . .	Franklin Terrace, ...	5 inch,	Aug. 7, 1899.
Sept. 2, 1899,	Melrose, . .	At the junction of Belmont Street and Belmont Place, . . .	6 inch,	Aug. 26, 1899.
Sept. 23, 1899,	Melrose, . .	Proposed street through meadow on estate of F. A. Messenger, .	5 inch,	Sept. 23, 1899.
Sept. 23, 1899,	Melrose, . .	Brunswick Park, ...	5 inch,	Sept. 22, 1899.
Oct. 7, 1899,	Melrose, . .	Vinton Street, 16.18 feet north of man-hole, Station 14+89.25 (Brunswick Park), . . .	5 inch,	Oct. 28, 1899.
Nov. 4, 1899,	Melrose, . .	8 and 10 Grove Street, 89.10 feet east of man-hole at Berwick Street, ...	5 inch,	Nov. 4, 1899.
Nov. 11, 1899,	Melrose, . .	3 and 4 Berwick Street, Station 3+38.28, ...	5 inch,	Nov. 17, 1899.
Nov. 11, 1899,	Melrose, . .	5 and 6 Berwick Street, Station 3+99.53, ...	5 inch,	Nov. 11, 1899.
Mar. 31, 1900,	Melrose, . .	Tremont Street, 85.8 feet north of Union Street, ...	5 inch,	Apr. 5, 1900.
April 21, 1900,	Melrose, . .	Greenwood Street, 29.49 feet north of Station 38+22.11, north of Franklin Street, ...	5 inch,	Apr. 25, 1900.
April 21, 1900,	Melrose, . .	24 Greenwood Street, 129.89 feet north of first man-hole (Station 38+22.11), north of Franklin Street, ...	5 inch,	Apr. 25, 1900.
April 28, 1900,	Melrose, . .	87 Myrtle Street, at Station 11 +70.8, ...	5 inch,	May 1, 1900.
April 28, 1900,	Melrose, . .	95 Myrtle Street, at Station 12 +78.3, ...	5 inch,	May 1, 1900.
June 2, 1900,	Melrose, . .	Greenwood Street, 40.37 feet north of man-hole, Ashburton Place, .	5 inch,	May 25, 1900.
June 2, 1900,	Melrose, . .	Brunswick Way, Station 10+74, man-hole at junction of Brunswick Park, ...	5 inch,	June 1, 1900.
June 16, 1900,	Melrose, . .	Franklin Street, 64.29 feet west of man-hole at Station 32+06.81, .	5 inch,	June 20, 1900.
June 29, 1900,	Melrose, . .	205 Tremont Street, 189.8 feet north of man-hole at Union Street, .	5 inch,	June 20, 1900.
Aug. 27, 1900,	Melrose, . .	33 Greenwood Street, 129.89 feet north of man-hole at Station 38+22.11, ...	5 inch,	Aug. 30, 1900.

TABLE J. — *List of Connections, etc.* (*North Metropolitan System*) — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Aug. 27, 1900,	Melrose, . .	35 Greenwood Street, 202.89 feet north of man-hole at Station 38+22.11, ...	5 inch,	Aug. 30, 1900.
Aug. 27, 1900,	Melrose, . .	41 Greenwood Street, 87.19 feet north of man-hole at Station 40+43.11, ...	5 inch,	Aug. 31, 1900.
Aug. 27, 1900,	Melrose, . .	43-45 Greenwood Street, 135.79 feet north of man-hole at Station 40+43.11, ...	5 inch,	Aug. 31, 1900.
Nov. 9, 1895,	Somerville, .	On Mystic Avenue, at Moreland Street, ...	12 inch,	Mar. 21, 1896.
April 25, 1896,	Somerville, .	Corner Mystic and Winthrop avenues, ...	30 inch,	May 29, 1896.
May 16, 1896,	Somerville, .	Corner Rowland and Waverly streets, ...	24 inch,	July 21, 1896.
Sept. 19, 1896,	Somerville, .	Corner Somerville Avenue and Poplar Street, ...	48 inch,	Oct. 20, 1896.
June 4, 1898,	Somerville, .	Broadway, near Alewife Brook, .	12 inch,	Aug. 15, 1898.
July 9, 1898,	Somerville, .	Woodstock Street, near Waterhouse Street, ...	12 inch,	Sept. 21, 1898.
Sept. 24, 1898,	Somerville, .	Somerville Avenue and Poplar Street, ...	2 foot,	Nov. 1, 1898.
Nov. 5, 1898,	Somerville, .	On the estate of Levi Russell, near North Street, ...	12 inch,	Dec. 17, 1898.
July 29, 1889,	Stoneham, .	At the end of the metropolitan sewer in Franklin Street, near Melrose line, ...	10 inch,	Nov. 22, 1899.
June 22, 1895,	Winchester, .	Corner Main and Church streets, ...	10 inch,	Feb. 27, 1895.
June 22, 1895,	Winchester, .	Common Street, ...	10 inch,	Feb. 27, 1895.
June 22, 1895,	Winchester, .	Rear of freight sheds, Boston & Maine Railroad, ...	15 inch,	Mar. 21, 1895.
Jan. 26, 1895,	Winchester, .	Near siphon at Mystic station at Abbajona River, ...	10 inch,	July 21, 1895.
Jan. 26, 1895,	Winchester, .	Old Mystic valley sewer, near Abbajona River, ...	10 inch,	Aug. 8, 1895.
-	-	Turned the old Mystic valley sewer into the metropolitan sewer, ...	-	July 18, 1895.
Oct. 3, 1896,	Winchester, .	Easterly side of metropolitan sewer in Cross Street, . .	12 inch,	Oct. 17, 1896.
Nov. 30, 1895,	Winchester, .	275 feet south of Swanton Street, Station 5+11.20, Section 45, .	15 inch,	Dec. 21, 1895.
Aug. 1, 1896,	Winchester, .	On westerly side of metropolitan sewer in Mystic valley parkway, at man-hole, ...	18 inch,	Aug. 25, 1896.
Nov. 20, 1897,	Winchester, .	Beggs & Cobbs' currying establishment, ...	6 inch,	Dec. 6, 1897.
May 12, 1900,	Winchester, .	Private way, Station 56.55, Section 45, about 400 feet west of Washington Street, ...	5 inch,	Not made.

TABLE J. — *List of Connections, etc. (North Metropolitan System)* — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
May 12, 1900,	Winchester,	233 Main Street, south of Wedge Pond bridge,	5 inch,	May 25, 1900.
Jan. 27, 1894,	Winthrop,	Shirley Street, corner Washington Avenue,	12 inch,	Jan. 17, 1895.
July 6, 1895,	Winthrop,	Pleasant Street, near Belle Isle Inlet,	12 inch,	Aug. 24, 1895.
Oct. 12, 1895,	Winthrop,	Shirley Street, Short Beach,	10 inch,	Oct. 29, 1895.
July 22, 1896,	Winthrop,	At Magee's Corner,	12 inch,	Oct. 8, 1896.
June 10, 1899,	Winthrop,	Tafts Avenue,	6 inch,	June 27, 1899.
Aug. 13, 1900,	Winthrop,	Man-hole near Winthrop Street,	8 inch,	Sept. 14, 1900.
May 25, 1895,	Woburn,	Corner Canal and Lake streets,	15 inch,	Oct. 9, 1895.
Sept. 7, 1895,	Woburn,	In private land, Baeder, Adamson & Co., glue works settling tanks,	8 inch,	Nov. 9, 1895.
July 6, 1895,	Woburn,	Old Mystic valley sewer, at Cross Street,	15 inch,	Sept. 2, 1895.
July 18, 1895,	Woburn,	80 feet north of Cross Street, end of old Mystic valley sewer (temporary),	15 inch,	July 18, 1895.

Charles River System.

May 3, 1892,	Boston,*	Cambridge Street, corner Seattle Street,	15 inch,	May 3, 1892.
May 6, 1892,	Boston,*	Rena Street,	12 inch,	May 6, 1892.
Sept. 27, 1892,	Boston,*	Western Avenue, foot of Market Street,	18 inch,	Sept. 27, 1892.
Oct. 28, 1892,	Boston,*	Western Avenue, near Everett Street,	24 inch,	Oct. 28, 1892.
Jan. 27, 1893,	Boston,*	Near Salt Creek,	24 inch,	Jan. 27, 1893.
May 2, 1893,	Boston,*	Near Parson's Brook,	24 inch,	May 2, 1893.
July 1, 1893,	Boston,*	Near Faneuil station,	15 inch,	July 1, 1893.
July 12, 1893,	Boston,*	Rena Street, corner Bertram Street,	15 inch,	Aug. 25, 1893.
Aug. 19, 1893,	Boston,*	Abattoir, Station 24 + 08,	15 inch,	Sept. 26, 1893.
Aug. 19, 1893,	Boston,*	Abattoir, Station 34 + 63,	15 inch,	Oct. 6, 1893.
Sept. 9, 1893,	Boston,*	Abattoir (tripe works),	15 inch,	Oct. 26, 1893.
May 12, 1894,	Boston,*	Parsons Street, opposite Taylor's Mill,	24 inch,	July 31, 1894.
Nov. 17, 1894,	Boston,*	Corner North Harvard and Spurr streets,	15 inch,	Nov. 20, 1894.
May 24, 1892,	Boston,	Brookline Avenue, corner Bellevue Street,	12 inch,	May 24, 1892.
May 30, 1892,	Boston,	133 feet north of Brookline Avenue, Back Bay Fens,	6 inch,	May 12, 1893.

* Brighton.

TABLE J. — *List of Connections, etc. (Charles River System)* — Continued.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
May 19, 1894,	Boston,	Huntington Avenue, near Parker Street,	12 inch,	May 30, 1894.
Oct. 13, 1892,	Boston,	Commonwealth Avenue and St. Mary Street,	18 inch,	Oct. 13, 1892.
Feb. 3, 1893,	Boston,	Vila Street,	24 inch,	Feb. 3, 1893.
May 12, 1893,	Boston,	Park Commissioners, Administration Building,	6 inch,	May 12, 1893.
May 19, 1894,	Boston,	Huntington Avenue and Parker Street,	12 inch,	May 30, 1894.
July 20, 1895,	Boston,	Corner Huntington Avenue and Bryant Street, on south side of metropolitan sewer,	24 inch,	Sept. 19, 1895.
July 20, 1895,	Boston,	Corner Huntington Avenue and Bryant Street, on north side of metropolitan sewer,	12 inch,	Sept. 26, 1895.
Dec. 2, 1899,	Boston,	Fenway at Worthington Street extension,	10 inch,	Nov. 29, 1899.
April 29, 1892,	Brookline,	Commonwealth Avenue, corner St. Mary Street,	24 inch,	Apr. 29, 1892.
May 3, 1892,	Newton,	At Lemon or Hyde Brook,	24 inch,	May 3, 1892.
May 4, 1892,	Newton,	California Street, corner Crescent Street,	24 inch,	May 4, 1892.
May 28, 1892,	Newton,	Nonantum Street,	10 inch,	May 28, 1892.
Oct. 8, 1892,	Newton,	Near Cheesecake Brook,	24×36 in.	Oct. 8, 1892.
May 11, 1893,	Newton,	California and Said streets,	10 inch,	May 11, 1893.
Sept. 1, 1893,	Newton,	California and Dalby streets,	10 inch,	Sept. 1, 1893.
Oct. 26, 1895,	Newton,	In garden of Sarah L. M. Bates, near Hyde Brook,	5 inch,	Nov. 4, 1895.
May 2, 1896,	Newton,	In land of estate of Matilda Emerson, east of Hyde Brook,	5 inch,	May 18, 1896.
June 24, 1892,	Waltham,	Corner North and Calvary streets, at the end of the metropolitan sewer,	–	June 24, 1892.
June 9, 1892,	Watertown,	California Street, corner Galen Street,	24 inch,	June 9, 1892.
July 9, 1892,	Watertown,	Watertown Street, corner California Street,	10 inch,	July 9, 1892.
July 9, 1892,	Watertown,	Water Street, on the east side of the metropolitan sewer,	8 inch,	July 9, 1892.
July 9, 1892,	Watertown,	Water Street, on the west side of the metropolitan sewer,	8 inch,	July 9, 1892.
May 26, 1893,	Watertown,	Barker's Starch Factory,	6 inch,	May 26, 1893.
July 1, 1893,	Watertown,	Hickory Wheel Company,	5 inch,	Never connected.
June 26, 1897,	Watertown,	At siphon at U. S. Arsenal,	18 inch,	July 21, 1897.
Sept. 16, 1899,	Watertown,	Locomobile Company near Water Street,	6 inch,	Oct. 13, 1899.

TABLE J. — *List of Connections, etc.* (*Neponset Valley System*) — Concluded.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
July 10, 1897,	Boston,* . .	River Street, near Fremont Street,	15 inch,	July 13, 1897.
Sept. 3, 1898,	Boston,† . .	Near Spring Street (Parental School), ...	12 inch,	Aug. 14, 1898.
Sept. 3, 1898,	Boston,† . .	Weld and LaGrange streets, . .	12 inch,	Sept. 15, 1898.
May 14, 1898,	Boston,* . .	Near Idaho Street, ...	12 inch,	Nov. 13, 1898.
May 21, 1898,	Boston,* . .	Adams and Butler streets, . .	12 inch,	July 18, 1898.
July 30, 1898,	Boston,* . .	Adams Street, near junction of Shawmut Branch and Old Neponset road, ...	15 inch,	Oct. 14, 1898.
July 10, 1897,	Boston,* . .	River Street, near Fremont Street,†	15 inch,	July 13, 1897.
Dec. 3, 1898,	Boston,* . .	Huntoon Street, ...	12 inch,	Dec. 23, 1898.
Jan. 7, 1899,	Boston,† . .	Weld Street, at man-hole at end of metropolitan sewer, . .	12 inch,	Jan. 7, 1899.
Sept. 2, 1899,	Boston,* . .	Proposed extension Blue Hill Avenue at Mattapan Square, . .	18 inch,	Jan. 12, 1900.
Aug. 6, 1900,	Boston,† . .	Gardner Street, east side of the metropolitan sewer, . . .	15 inch,	Aug. 6, 1900.
July 3, 1897,	Hyde Park, .	Fairmount Avenue, between New England Railroad and Neponset River, ...	12 inch,	Aug. 6, 1897.
July 3, 1897,	Hyde Park, .	Opposite extension of Milton Avenue, foot of Walter Street, . .	18 inch,	Oct. 14, 1897.
July 3, 1897,	Hyde Park, .	Arlington Street, corner Metropolitan Avenue, ...	15 inch,	Aug. 6, 1897.
July 3, 1897,	Hyde Park, .	Hyde Park Avenue, near Factory Street, ...	12 inch,	July 14, 1897.
July 10, 1897,	Hyde Park, .	Hyde Park Avenue, near Factory Street, ...	20 inch,	Aug. 11, 1899.
Aug. 11, 1897,	Hyde Park, .	Corner Business Street and Barry Place, ...	15 inch,	Sept. 7, 1897.
Oct. 9, 1897,	Hyde Park, .	Business Street, at Glenwood Street, ...	12 inch,	Sept. 27, 1898.
July 23, 1898,	Hyde Park, .	Walnut Street near New England Railroad, ...	8 inch,	Sept. 9, 1898.
May 6, 1899,	Hyde Park, .	West River Street, ...	8 inch,	June 16, 1899.
June 3, 1899,	Hyde Park, .	Sally Sumner estate, . . .	12 inch,	Aug. 30, 1899.
Sept. 4, 1897,	Milton, . .	Blue Hills Parkway, . . .	12 inch,	Nov. 16, 1897.
Nov. 20, 1897,	Milton, . .	Adams Street, ...	8 inch,	Nov. 30, 1897.
July 23, 1898,	Milton, . .	At Central Avenue, ...	15 inch,	Aug. 22, 1898.

* Dorchester. † West Roxbury.

TABLE K.— BILLS OUTSTANDING SEPT. 30, 1900.

High-level Sewer. — Construction Account.

NAME.	Articles.	Amount.
Burditt & Williams,	Hardware,	$14 48
Thorp & Martin Company,	Supplies,	21 26
Wright & Potter Printing Company,	Printing,	123 16
Boston Herald Company,	Advertising,	22 86
Curtis & Pope Lumber Company,	Pipe and stopper,	192 06
Frost & Adams Company,	Supplies,	25 25
Gilbert & Barker Manufacturing Company,	Gasolene,	6 12
U. Holzer,	Mounting maps, etc.,	6 24
Horgan, Robey & Co.,	Photographic supplies,	13 40
Journal Newspaper Company,	Advertising,	44 10
Thomas Minton,	Rent of office, Forest Hills,	18 00
Chas. E. Moss,	Blue-printing,	19 71
A. G. Nelson,	Services as janitor,	6 50
New England Telephone and Telegraph Company.	Telephone service,	41 30
New York, New Haven & Hartford Railroad Company.	Tickets,	88 40
B. W. O'Neil & Co.,	Bottles,	8 01
Quincy Real Estate Trust,	Rent of office, Quincy,	19 75
Wm. Read & Sons,	Lamps and carbide,	6 75
Wadsworth, Howland & Co.,	Paints, etc.,	6 81
Walworth Manufacturing Company,	Wrench, drill point, etc.,	12 67
Edison Electric Illuminating Company,	Electric service,	14 65
Baker-Hunnewell Company,	Coal,	20 50
The Engineering News Publishing Company,	Advertising,	20 40
The Engineering Record,	Advertising,	18 80
Heliotype Printing Company,	Negative and print,	11 00
Kate M. Hill,	Photograph,	4 80
G. G. Ledder,	Plumb bobs, etc.,	4 34
J. C. Storey & Co.,	Tarred paper,	5 90
C. M. Joyce,	Services as rodman,	4 80
Seth Peterson,	Incidentals,	2 47
Sampson, Murdock & Co.,	Directories,	11 00
Anthony Hansson,	Incidentals,	3 50
Damrell & Upham,	Year book,	3 00
Henry Cleary,	Incidentals,	86 40
G. H. Worcester & Co.,	Brushes, dusters and mops,	8 30
Wyckoff, Seamans & Benedict,	Typewriter paper and ribbons,	4 90
Watts Bros.,	Rod,	3 00

TABLE K. — *Bills outstanding, etc.* (*High-level Sewer*) — Continued.

NAME.	Articles.	Amount.
Allen Bros.,	Rubber stamps,	$1 40
Carter, Rice & Co.,	Paper bags,	1 25
Library Bureau,	Index cards,	5 05
Frank W. Gleason & Co.,	Plumbing,	2 10
Becker-Brainard Milling Machine Company,	Castings,	4 13
Boston Woven Hose and Rubber Company,	Rubber hose and couplings,	2 08
Codman & Shurtleff,	Repairing erasers,	50
W. J. McGraw & Co.,	Rubber stamp,	3 00
Jas. Stewart & Co.,	Lead,	94
New England Towel Supply Company,	Washing towels,	4 36
E. & F. King & Co.,	Sal ammonia,	90
C. L. Berger & Sons,	Cleaning and repairing transit,	3 90
M. R. Warren Company,	Stationery,	5 23
Boston Electric Light Company,	Electric service,	2 00
Hammond Typewriter Company,	Typewriter supplies,	1 70
The O. Sheldon Company,	Points for electrodes,	1 50
Spatula Publishing Company,	Filing bands,	1 63
Dennison Manufacturing Company,	Tags, etc.,	3 38
Corson Express Company,	Express,	2 00
Frank E. Fitts Manufacturing and Supply Company.	Oil can,	1 80
A. J. Wilkinson & Co.,	Hardware,	2 88
Anthony Hanson,	Incidentals,	1 70
Jamaica Plain Gas Light Company,	Gas service,	1 20
J. L. Fairbanks & Co.,	Stationery,	4 10
A. H. Smith,	Incidentals,	34 45
A. F. Carter,	Soap,	1 13
Boston Belting Company,	Hose and couplings,	4 11
A. B. Allen,	Services as rodman,	30 00
E. Elbert Young,	Incidentals,	31 08
Waldo Bros.,	Sand,	40
P. G. Darling,	Services as rodman,	41 60
R. F. Hanson,	Services as rodman,	3 06
G. C. Capelle,	Services as rodman,	41 06
Suffolk Registry of Deeds,	Recording deed,	65
A. D. Maclachlan,	Cross-section paper,	1 88
F. D. Smith,	Incidentals,	61 03
Jamaica Plain Electric Company,	Labor and plugs,	1 25
John Hodgkinson & Son,	Sawing stakes,	1 25

TABLE K. — *Bills outstanding, etc. (High-level Sewer)* — Continued.

NAME.	Articles.	Amount.
L. Herbert Bigelow,	Services as rodman,	$15 00
Sylvanus M. Parsons,	Land damage,	50 00
O. S. Gordon,	Incidentals,	1 87
R. H. Sumner,	Incidentals,	14 43
Philip Healey,	Incidentals,	8 25
F. C. Williams,	Incidentals,	9 15
Boston Electric Light Company,	Electric service,	1 00
Walter Kimball & Co.,	Frame,	4 00
C. B. Pratt,	Incidentals,	26 50
Daniel J. McGillivray,	Labor,	2 30
Total,		$1,369 31

Neponset Valley System. — Construction Account.

Thos. F. Cunningham,	Land damage,	$50 00
Norfolk Registry of Deeds,	Recording deed,	65
Thomas F. Reddy,	Legal services,	13 50
Total,		$64 15

Neponset Valley System. — Maintenance Account.

H. & L. Chase,	Sand bags,	$1 40
Jos. Breck & Sons,	Oats and grass seed,	3 25
New England Bolt and Nut Company,	Rivets,	3 50
Total,		$8 15

North Metropolitan System. — Construction Account.

Walworth Manufacturing Company,	Couplings,	$1 32
Burditt & Williams,	Hardware,	4 64
Frank I. Capen,	Incidentals,	31 69
C. L. Berger & Sons,	Plumb bobs,	4 50
Buff & Buff Manufacturing Company,	Adjusting level,	2 10
T. H. Buck & Co.,	Lumber,	1 96
Eastman's Express,	Teaming,	25
Suffolk Registry of Deeds,	Recording taking and plan,	2 00
T. T. Allard,	Services as assistant engineer,	31 48
J. H. Stubbs,	Incidentals,	14 05

TABLE K. — *Bills outstanding, etc.* (*North Metropolitan System*) — Continued.

NAME.	Articles.	Amount.
J. C. Storey & Co.,	Tarred paper,	$4 00
Allen Bros.,	Rubber stamps,	3 40
Hopkinson & Holden,	Brooms, shovels, etc.,	3 50
Wright & Potter Printing Company,	Printing,	108 58
Boston & Maine Railroad,	Tickets,	25 50
Fitz, Dana & Co.,	Iron,	23 63
Journal Newspaper Company,	Advertising,	27 00
Charles E. Moss,	Blue-printing,	16 50
Sumner & Goodwin Company,	Pipe,	10 18
Edwin S. Small & Co.,	Rent of office room,	30 00
Total,		$346 28

North Metropolitan System. — Maintenance Account.

Sumner & Goodwin Company,	Pipe,	$2 82
Alexander Haggerston,	Carriage service,	33 60
New England Railway Publishing Company,	Pathfinder,	2 50
Weeks & Potter Company,	Oxide,	50
The Noyes Manufacturing Company,	Disinfectant,	1 50
Jos. A. Williams,	Repairing clocks,	4 00
Daniel McGarrigle,	Carriage service,	32 00
Library Bureau,	Index cards,	2 25
Peabody-Whitney Company,	Step-ladder,	1 50
E. & F. King & Co.,	Oxalic acid,	71
Chas. E. Moss,	Blue-printing,	3 65
Crosby Steam Gage and Valve Company,	Verbund glasses,	4 23
American Steel and Wire Company,	Pump springs,	7 30
P. O'Riorden,	Sand,	3 60
A. J. Wilkinson & Co.,	Hardware,	13 56
The Wm. H. Gallison Company,	Cosmic,	1 40
M. S. Haley,	Sand,	3 60
Chapman Valve Manufacturing Company,	Valve,	4 65
Geo. W. Knowlton Rubber Company,	Packing,	8 40
George W. Branch,	Packing,	50
Scrannage Bros.,	Boring,	5 75
Jas. Wilkinson & Co.,	Electrical work,	5 10
Iver Johnson Sporting Goods Company,	Linen line,	2 40

TABLE K. — *Bills outstanding, etc.* (*North Metropolitan System*) — Continued.

NAME.	Articles.	Amount.
Blodgett Bros.,	Repairing lights,	$2 45
G. G. Ledder,	Engineering supplies,	4 20
Underhay Oil Company,	Oil,	7 66
C. H. McKenney & Co.,	Lamp wicks and chimneys,	2 35
City of Somerville,	Water supply,	106 92
Metropolitan Coal Company,	Coal,	853 20
Wright & Potter Printing Company,	Printing,	71 41
Bacon & Co.,	Iron,	10 18
Boston Gear Works,	Gears, etc.,	10 95
Boston & Maine Railroad,	Tickets,	7 50
T. H. Buck & Co.,	Lumber,	8 01
Frank E. Fitts Manufacturing and Supply Company.	Waste,	7 20
D. F. Gallagher & Co.,	Iron,	14 12
Globe Rubber Works,	Valves and packing,	35 66
Austin Gove & Sons,	Coal,	21 25
J. H. McCafferty & Co.,	Patterns,	12 02
Stoughton Rubber Company,	Gloves,	6 30
Thorp & Martin Company,	Supplies,	15 90
Wadsworth, Howland & Co.,	Paint, oil and varnish,	18 46
O. S. Gordon,	Incidentals,	1 20
Theodore Horton,	Incidentals,	9 52
Chandler & Farquhar,	Batteries,	3 60
Carter, Rice & Co.,	Paper,	99
Smith & Anthony Company,	Castings and repairing furnace,	6 42
Butts & Ordway Company,	Steel,	1 18
M. R. Warren Company,	Stationery,	3 00
Chas. A. Schieren & Co.,	Packing,	4 44
Lockwood Manufacturing Company,	Making bolt, etc.,	4 20
Oriental Tea Company,	Coffee,	1 50
Boston Bolt Company,	Bolts,	4 35
Henry P. Fielding,	Incidentals,	72
Henry J. Wright,	Incidentals,	20 93
Robt. A. Jordan, assignee,	Electrical supplies,	7 10
Red Line Transit Company,	Transportation,	8 74
Frank I. Capen,	Incidentals,	11 10
The Atlantic Works,	Iron forgings,	77 63
Geo. H. Meader,	Repairing electrical engine,	69 54

TABLE K. — *Bills outstanding, etc. (North Metropolitan System)* — Concluded.

NAME.	Articles.	Amount.
Reynolds Oil Company,	Oil,	$46 80
Standard Oil Company,	Gasolene,	5 87
G. H. Worcester & Co.,	Brooms,	7 50
L. W. Ferdinand & Co.,	Oars, paint, oil, etc.,	6 36
U. Holzer,	Mounting lithograph,	75
Allen Bros.,	Rubber stamps,	3 00
Eyelet Tool Company,	Repairing punch,	65
Pittsburgh Plate Glass Company,	Glass,	2 11
Damrell & Upham,	Book,	2 40
Burditt & Williams,	Saw blades,	30
Jenkins Bros.,	Gauges, valves, glasses, etc.,	9 07
Henry R. Worthington,	Valves, etc.,	1 31
James Tucker & Sons,	Plumbing and repairing,	3 35
B. W. O'Neil & Co.,	Bottles,	60
Boston Steam Specialty Company,	Valves,	1 74
A. W. Chesterton & Co.,	Brass springs,	4 80
Walworth Manufacturing Company,	Pipe,	19 09
Total,		$1,713 12

Charles River System. — Maintenance Account.

Henry J. Wright,	Incidentals,	$5 85
Thorp & Martin Company,	Proportionate cost of check-book,	3 44
Total,		$9 29

TABLE L. — ASSETS AND LIABILITIES, SEPT. 30, 1900.

Assets.

Office furniture, fittings and supplies, including fittings for field officers, stationery, etc.,	$3,880 85
Engineers' instruments and supplies, including railroad tickets,	3,494 84
Engines, pumps, boilers, derricks, inclines, buckets, row boats, dump cars and heavy appliances,	4,053 50
Pumping station fixtures, tools and supplies,	10,350 57
Miscellaneous tools,	647 45
Miscellaneous supplies,	1,573 54
Engineers' field offices, sheds, barns, tool houses, carts, express wagon, horse and harnesses,	1,059 00
Stock yard and building, East Boston,	2,500 00
Land for stock yard, Hyde Park,	167 00
Vacant lots, Chelsea,	1,300 00
Vacant lots, Winthrop,	1,800 00
Vacant lot, site of high-level pumping station,	60,000 00
Total,	$90,826 75

There are numerous necessary plans, drawings, calculations and studies relating to the work, to which no stated value can be assigned; also about 71.9 miles of completed sewer, with pumping stations, siphons and other accessories necessary for operating the systems.

Liabilities.

Amounts due contractors on estimates,	$40,269 10
Amount unpaid on estimated land damages, including amounts barred by the statute of limitations,	9,987 24
Fraction of pay rolls (laborers),	642 50
Fraction of pay rolls (engineers),	1,768 14
Commissioners', chief engineer's and clerical pay rolls,	1,333 34
Unpaid bills, — miscellaneous (see pages 114–119),	3,499 30
Total,	$57,499 62

There are also amounts due on pumping plant contracts which will be paid on succeeding estimates. Also there are cases pending in court. Such sums as may become due and payable on account of these cannot now be determined with any accuracy (see page 99).